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ABSTRACT

This document contains the following full and short papers on telecommunications in education from ICCE/ICCAI 2000 (International Conference on Computers in Education/International Conference on Computer-Assisted Instruction): (1) "A Flexible Transaction Model for Virtual School Environments" (Woochun Jun and Sukki Hong); (2) "Design and Implementation of a WWW-Based School Official Memorandum System" (Gi-Ping Lee, Yue-Shan Chang, and Ching-Chuan Chou); (3) "Design and Implementation of Web-Based Learning System for Teacher-Training Programme" (Wai-Ming Yip and Wing Kee Au); (4) "Development of Japanese-English, English-Japanese Conversation System with Voice Reading and Machine Translation" (Yumemi Matsuzaki and Kanji Akahori); (5) "The Gathering and Filtering Agent of Educational Newspaper for NIE" (Chul-Hwan Lee, Sun-Gwan Han, and Hee-Seop Han); (6) "Integrating Electronic Mail Systems in Computer Literacy Instruction: Its Impacts on Student Attitudes and Interpersonal Relationships" (Fu-Yun Yu); (7) "Network Usage Survey and Its Analysis with Related Factors between University Students and Occupational Groups in Taiwan" (Gin-Fon Nancy Ju); (8) "Online ESL Learning: An Authentic Contact" (Yu-Chih Doris Shih and Lauren Cifuentes); (9) "Relating Telecommunication Training Objectives to SMEs' Actual Needs" (Paola Forcheri, Maria Teresa Molfino, and Alfonso Quarati); and (10) "Web Based Real Plus Virtual Observatory Project" (Masato Soga, Takuma Okuno, and Hideaki Kawanishi). (MES)

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Proceedings

Content

▶Full & Short Papers (Telecommunication in Education)

A Flexible Transaction Model for Virtual School Environments
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DESIGN AND IMPLEMENTATION OF WEB-BASED LEARNING SYSTEM FOR TEACHER-TRAINING PROGRAMME
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Relating telecommunication training objectives to SMEs' actual needs
Web Based Real plus Virtual Observatory Project

▲HOME

A Flexible Transaction Model for Virtual School Environments

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Recent advances in Internet technologies have led to the advent of virtual schools. However, existing technologies have many limitations when applied to virtual school implementation. Especially, existing transaction models are not suitable for supporting virtual schools. In this paper, we present a new transaction model in order to support virtual school environments. First, we introduce the general characteristics of the virtual school environments. Then, we discuss transaction model requirements for virtual schools. Based on those requirements, we propose a new transaction model. We also show a locking-based concurrency control scheme for supporting collaboration works among students. Finally, we give conclusions and future research issues.

Keywords: **Collaborative Learning, Virtual School**

1 Introduction

Recently interests in virtual schools have been increasing due to advances in Internet technologies. The virtual school, which is based on distance learning, can overcome time and space limitations in the traditional schools. But, in order to complement lack of face-to-face communication in virtual schools, multimedia-based education is becoming popular. This multimedia-based education emphasizes the students' self-control. That is, multimedia- based education encourages interactions between teachers and students and also interactions among students. In the meanwhile, object-oriented databases become popular for supporting multimedia resources.

In the literature, many transaction models have been proposed for object-oriented database environments [5,7,8]. But, those transaction models have not reflected requirements in virtual schools. In this work, we propose a new transaction model that supports virtual school environments. The proposed model considers all those requirements.

This paper is organized as follows. In section 2, we discuss the transaction requirements in virtual school environments. Based on the discussion, we propose a new transaction model in Section 3. In Section 4, we present a locking-based concurrency control technique based on our model. Finally, we give conclusions and future research issues.

2 Transaction Requirements in Virtual School Environments

In this section we discuss transaction requirements in virtual school environments.

First of all, all transactions should maintain the correctness of database. One of the characteristics of database systems is manipulation of shared data. In this case, concurrency control technique is required to

synchronize accesses to the database so that the consistency of the database should be maintained. Concurrency control technique requires an application-dependent correctness criterion to maintain database consistency while transactions are running concurrently. Serializability is a widely used correctness criterion [1,6]. But, serializability is too harsh for most applications so that we need user-defined correctness criteria, which is less restrictive than serializability.

Second, the length of transactions must be flexible. Usually, transaction length in virtual school environment is long since transactions are navigating on various multimedia information in database systems [2]. For long transaction case, the following problems might occur. That is, if locking-based concurrency control is adopted, long transaction blocks other transactions to run concurrently due to conflicting access. This will, in turn, degrade overall performance. Also, if a long transaction is aborted during its execution, it may waste execution time and resources it used.

Third, in virtual school environments, students' behavior is unpredictable. That is, since they are working in on-line way, it is hard to predict what kinds of actions they might take. Thus, they must be given some kind of self-controls.

Fourth, the transaction model reflects interactivity. Especially, it must support collaborative works between students and teacher or among students. Those collaborative works require common data to be shared among users in order to achieve common goal. In some cases, unlike traditional transaction model, uncommitted result by one student may be open to other students.

Finally, transaction model may need to support parallelism in order to reduce overall transaction response time. Especially, the parallelism can be used in object-oriented databases as follows. In object-oriented database, objects are accessed by means of methods. A method is nothing but a procedure to read or update attributes in objects. Two methods can run concurrently if they access different attributes in an object. Thus, transaction response time can be reduced by adopting parallelism.

3 The Proposed Transaction Model

Our transaction model reflects all requirements of transaction in virtual school environments as discussed in Section 2.

Our model is based on both Split/Join transaction model [4,9] and nested transaction model [7]. But, none of them support all those requirements of transactions in virtual school environments. Our model is to combine these two models. Our model also extends the previous model [3] so that we achieve higher parallelism as below.

The Split/Join transaction is summarized as follows. The Split/Join transaction is to restructure in-progress transaction dynamically so that it supports efficient resource management as follows. The Split transaction can be divided into two serializable transactions during its execution. In this case, two divided transactions can proceed independently with their own resources. Thus, the Split transaction model provides flexibility in resource management so that it can overcome the disadvantage of long transaction. On the other hand, the Join transaction can merge two on-going serializable transactions into one transaction. In this case, the transaction model is used to combine collaborating works into one in virtual school environments.

The nested transaction model is summarized as follows. A nested transaction consists of concurrently executable top-level transactions. In turn, a top-level transaction consists of one or more steps. Each step is either atomic operation or subtransaction. This subtransaction can run concurrently with top-level transactions or other subtransactions. In the meanwhile, a subtransaction can invoke another subtransaction. Thus, unlike flat transaction model, nested transaction model can exploit internal parallelism.

The basic structure of the proposed transaction model is shown in Fig. 1.

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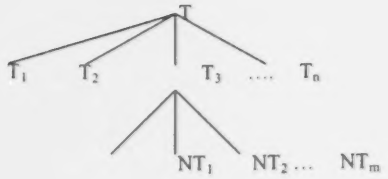

Fig. 1. The transaction model

T represents global transaction, which can be merged or split in various form during its execution. Also, depending on its nature, it can be committed without any restructuring. T_1, T_2, ,,,,T_n represent subtransaction or merged or split transaction. Also, NT_1, NT_2,,,NT_n represent subtransactions started by a nested transaction. In our model, we adopt open nested transaction [8]. In open nested environment, intermediate results of a subtransaction can be seen by other subtransaction as well as top-level transactions. This will increase parallelism further.

4 The Proposed Concurrency Control Technique

In this Section, we present a concurrency control technique based on our model. The proposed model is based on locking-based scheme. Our aim is to let two conflicting transactions go to negotiation stage if the lock requesting transaction requests a conflicting lock on a data item with a lock held by other transaction. In that case, the lock holding transaction and the lock requesting transaction can negotiate for conflicting lock types. If negotiation is successful by those two transactions, the lock requesting transaction can get a lock successfully and access the data. Otherwise, the lock request is blocked until the lock holding transaction release its locks. By doing so, the parallelism can be maximized among collaborating users. Assume that a transaction requests lock (L_R) on a data item already locked by other transaction with lock type (L_H), the following algorithm can be applied.

If L_R and L_H are compatible then grant L_R
    Else negotiate between lock requester and lock holder;
        If negotiation is successful then grant the lock
            Else block the lock request;

5 Conclusions and Future Works

In this paper, we first introduce the general characteristics for virtual schools. Then, we present all possible requirements for transactions in virtual school environments. Those requirements are user-defined correctness, flexible transaction length, the unpredictability, interactivity and internal parallelism. Based on those requirements, we propose a transaction model and a locking based concurrency control technique.

The immediate research issue is to apply real-time concept in transaction management. In that case, each transaction must have real-time deadline. Since all transactions are on-line based in virtual school environments, the transaction response time is very critical. Thus, we will develop the real-time priority assignment scheme and real-time transaction processing scheme for virtual school environments.

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Design and Implementation of a WWW - Based School Official Memorandum System

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1 Introduction

The official memorandum is a very important document that offers a decision path of something in the most organizations. In general, the executed policy usually needs agreement of decision-maker through official memorandum. All the official memorandums are traditionally passed by one-by-one human delivery from faculties to managers in an organization. It may results in the lower performance of administrative. Even though some administrative operations are via e-mail or other approach. It have some limitations, such as the official documents usually need the signature of decision-maker, it is not ease to overcome via the e-mail.

In order to have a speedy the administrative operation environment, especially the official memorandum delivery, we design and implement a WWW-based Official Memorandum System in a school. That is a WWW application without any novel theory and technique. We apply the existing techniques used in the WWW environment to accomplish the application.

Obviously, the system is based on the client-server model. Implementing the system has some existing techniques can be used, such as CGI, Java/Servlet [3], Java/CORBA [3]. Lotus' InterNotes [1] product uses CGI mechanisms to allow Web browser access to documents and forms managed by the Notes Server. Documents to be placed on the Web are translated by a program to HTML. These documents and forms are accessed through a standard HTTP server as though they were normal HTML documents. Java is a portable object-oriented language, and also a good platform for writing client/server web-based applications. Servlets are secure protocol and platform-independent server side web-enabled software components, written in Java. Java/CORBA has a clear advantage over CGI solution, such as flexibility, maintainability, and responsiveness etc.

Security issue in the system will be taken care by using traditional approaches. There are two secure mechanisms will be used: one is account/password, the other is the firewall. First one can prevent non-authority user log-in into system and disrupt the system. All the general users must apply for an account excepting the chief of department. And the system will force all users to change the password periodically. This mechanism can avoid internal hackers. Second one is to avoid external hackers who intrude into system for non-authority accessing. Few hackers, of course, can intrude into and disrupt the system. Some approaches can be used for enhancing the security of information, such as data compression/decompression before accessing to/from database and checking the data consistency of duplicated database periodically. All of them are the future works

Fault tolerance is in order to enhance the reliability of system. In fault-tolerance community, many approaches have been proposed to enhance the data reliability [4,5]. The approach in the system is database replication. We use warm stand-by primary/backup scheme to improve the system availability. Many issues in the data replication that have to be guaranteed are employed like the [5]. These issues are such as idempotent operation, data consistency, and recovery. Because the system is a three-tier scheme, all operations supporting fault-tolerance are implemented in the core of the system. This feature can also prevent the database crash during the formal execution phase.

A complex system has to be manageable in an easy way. In order to enhance the system flexibility, a web-based management tools should be implemented. System manager can add and remove user easily. In

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addition, system manager can also maintain the database, such as record manipulation, in an easy way.

Many features are described previously. In addition, we will support some important functions shown as following: Official documents writing, Official documents progression tracking, Auto-delivery, Automatic signing, Urgent document notification.

2 Design and Implementation

According to the described above, we design the system architecture like as Figure 1. The architecture is simple and complete. The system includes an Official Memorandum System and a replicated database. The system will receive requests from clients. For security issue, we add a firewall in the front of web server. All the requests must be checked by the firewall for ensuring the request is an authority request. In addition, the Official Memorandum System is responsible for all the features described above, which include fault-tolerance. A replicated database is also included in the system. The database used in the system is the SQL database.

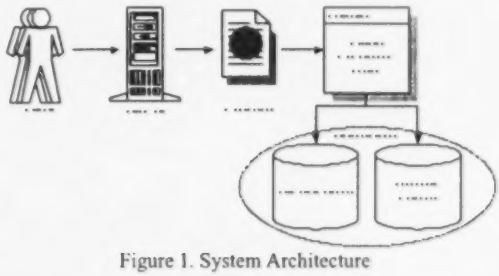

Figure 1. System Architecture

The whole system is implemented and run on the Windows NT 4.0 and SQL server 7.0. The programming paradigm is ASP that using VBscript. With the fault-tolerant, the system needs to access primary and standby database separately. To guarantee the consistency of two databases, we apply the traditional two-phase commit protocol on the replicated database transaction processing.

Figure 2 shows the GUI of document reviewing for those chiefs of department. When they login into the system, the system will show the urgent document on top of the reviewing page, which indicate these documents have to review first. The document reviewing process will sign the signature automatically when the process achieved.

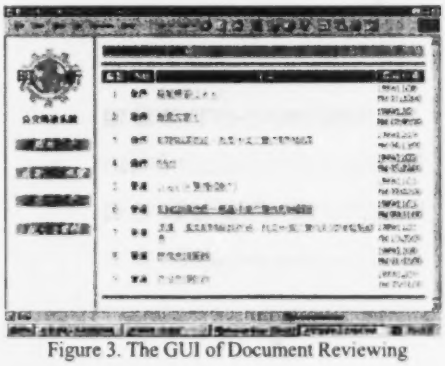

Figure 3. The GUI of Document Reviewing

3 Conclusions

In this paper, we have been stated the design and implementation of a web-based official memorandum system. This system can migrate the conventional official memorandum system to network. That is a WWW application without any novel theory and technique. We apply the existing techniques used in the WWW environment to accomplish the application. In order to avoid the informal accessing to this system, the firewall is utilized at the front-end of the system. Besides, the duplicated databases are used in this system to prevent the database crash during the formal execution phase.

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DESIGN AND IMPLEMENTATION OF WEB-BASED LEARNING SYSTEM FOR TEACHER-TRAINING PROGRAMME

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The advancement of recent technologies has evoked great impact on education. The Information Technology (IT) revolution has changed the habits of human civilizations immensely. The application of distributed systems, Internet, telecommunications and so on, along with the rapid development and advancement of computer technology, has given profound change to our life style and significant impact to our philosophy of education. Various contemporary issues in the application of IT in education have aroused widespread concern. Nowadays, learning is not necessarily confined within spatial and temporal boundaries. Networked databases, online resources and Internet services provide new opportunities for teachers and students to be engaged in learning and teaching activities which are different from the traditional classroom setting. In this paper, we are going to discuss the initial phase in designing and implementing a Web-based learning system for use in teacher-training programme. The research in building a Web-based supportive learning system for teacher training has the following characteristics: (1) It is a support system that aims to help the enhancement of learning effectiveness with the aids of modern information technologies, particular in the area of course information dissemination, sharing of resources, and computer mediated communication. (2) Future teachers are immersed in the IT learning environment so that a positive attitude and perception can be formed towards the adoption of IT in classroom. (3) Student teachers are encouraged to participate actively in the IT-immersion environment. After the initial phase completed, extended future research will be focus on its effectiveness and its empirical contribution in enhancing learning effectiveness.

Keywords: **Web-based Instruction**

1 Introduction

The application of Information Technology (IT) in education has recently generated lots of interests. With the advancement of new technologies, something impossible in the past was found significantly advantageous nowadays. One distinct example would be the use of digital technology and the continuous improvement of computer networks. The integration of text, sounds, graphics, and even video segments has been found more and more efficiently be used than in the past [9]. Undoubtedly, the fast growing multimedia technologies play

a vital role in enhancing better learning and teaching effectiveness. Internet and the use of the World Wide Web (WWW) have been regarded as a powerful media since its development began in early 90's. Networked database and distributed systems make the "knowledge" and information dissemination more efficient and faster. As the Internet and the WWW remove the geographically boundaries, learning and teaching activities need not happen at the same time and at the same place. Furthermore, communications between teachers and students, and among the students, which traditionally relied on face-to-face interactions, can be supplemented by both synchronous and asynchronous modes of communication through recent development of telecommunication and network technologies. In order to meet the new learning needs in the new millenium the idea of learning network is established for promoting life-long learning. With the help of an immersion learning environment using IT, students can construct and refine their knowledge through interactions with other students and teachers at anytime and anywhere. In fact, the number of schools and Universities using the Web to deliver courses are increasing [6].

2 Rationale in using Web-based learning system for teacher training programme.

Khan [5] suggests that the Internet is fast emerging and the WWW is becoming an increasingly powerful, global, interactive, and dynamic medium for delivering instruction. More and more institutions are using the Web to provide instruction and training. Increasing number of these institutions offering Web-based courses are recognizing the fact the Web is a viable and important medium for learning and instruction. As the capabilities of the Web have become more widely known, students and faculty have been quick to utilize its potential [4]. Research on the use of Web-based system in the past decade often focused on its contribution to distance learning, flexible learning or open learning. Each of the above three terms has its own meaning and are different from each other, yet all of them are regarding learning happened at learners' own time, pace and schedule. Internet offers the potential for a classroom reconfiguration through the utilization of WWW as a tool. Teachers are no longer regarded as absolute authority and the fount of knowledge, but the students begin to take responsibility for their individual learning. They become active participants in acquisition of knowledge and need to be responsible for their own development. However, traditional learning system and Web-based system are not necessarily mutually exclusive of each other. On the contrary, they may be employed to support each other. This idea becomes the fundamental principle in establishing a flexible, learner-centred and effective Web-based supportive environment for learning.

To establish an IT-immersion environment for future teacher

Most of the universities in Australia, U.S. and U.K. require their graduates to be information literate. Education faculties within these universities would add stipulations that their pre-service teacher graduates would need to be competent with the application of IT in education.[1]. Another major reason in the development and implementation of Web-based learning system is to create an IT immersion environment, so that future teachers can be immersed in the situation that not only IT skills or literacy be taught, but provide opportunities for student teachers to build up confidence in using IT. As a result, their positive attitude and perception towards the application IT in the classroom can be developed. How IT is used will vary depending on teacher' s understanding of technology and how it may be used to support the learning and teaching process. The development of student teachers' positive, confident attitudes, self-efficacy, and perceptions toward Information Technology is essential. Bandura [2] stated that people who perform poorly might do so because they lack the skills or they have the skills but they lack the sense of efficacy to use them well. General self-efficacy beliefs reflect a sense of personal control, a sense of personal competence and goal-directed determination. The teacher' s beliefs in their personal efficacy, ability to motivate and promote student learning will affect the types of learning environments they create and the level of academic progress their students will achieve.

Practise what we preach

Student teachers need to be IT competent before they enter into the profession. Teacher educators also have a distinct role in preparing competent teachers to teach IT or can teach with IT in the classroom. It would be desirable to enable student teachers immersed in the IT learning environment so that they can experience the possibilities in using networked technology and telecommunication as one of the learning media. More importantly, they are provided a chance to venture out and form the habit of life long learning, which is an essential element in their future success. In view of learning strategies, throughout the use of new

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communication tools, students also have chances to collaborative with other students, and most likely they will be benefit from this kind of learning and teaching activities [7].

Flexibility, learner-centred approach

It is generally agreed that the Internet has the potential to revolutionize learning. However Radford [8] pointed out that a flexible and location-independent education is certainly not a replacement for traditional human face-to-face interaction between teachers and students, but on the contrary, provides another means to facilitate better communication. He said not all learning activities should be technology mediated, but in some way some learning tasks may not require people to be in the same room and at the same time. Lai [6] said that many "Web-assisted" courses are designed with the intention to provide students with easier access to course-related materials. Lecture notes, examination scripts and other relevant materials are archived on course Web sites and allow flexible access by course participants. In addition, electronic mail and discussion lists are used to supplement face-to-face communication between students and teachers. In some cases, they are only needed to meet face-to-face once or twice in a course.

3 System design

A pilot scheme has been introduced to explore the possibilities in using Web-based learning system in the Hong Kong Institute of Education since September 1999. The main purpose of this project is to look for the best means to support learning and teaching, and in the long run, develop courses that can be offered to the students in a flexible manner. A number of essential design principles in designing a Web-based learning system can be identified:

- Interactivity: Major considerations to enhance interaction between the learners as well as the teacher, a wide range of synchronous or asynchronous tools are used to supplement and/or enhance face-to–face interactions.
- Collaboration, it is important to establish a supportive environment to encourage collaboration or forming online study groups.
- Social and interpersonal interaction: the cognitive dimension of learning environment, to build up a best environment for learning, and to promote social and interpersonal interaction.
- User control: it should be designed for students and teachers easy to manipulate and most importantly, sense of ownership by providing personal space such as virtual office.
- Structure and management of learning environment, a Web-based learning environment should be a flexible learning environment includes clear and explicit information and simple administrative task.

The pilot system design consists of three components and each one serves different purposes in supporting learning:

Instructional delivery system

The main function is for information dissemination where instructional materials, announcement, lecture notes, tutorials etc. can be delivered via the Web and the learners may access the information at any time at their own pace.

Database

For the purpose of resource sharing, it serves information exchange, link resources, web resources, shared project examples and a platform for collection of assignments and feedback etc.

Internet-mediated Communication

The communication channel between the teachers and the students forms an important part in the Web-based learning system. It aims to provide a platform for Internet-based communication. Although email is a "conventional" way extensively used, other software tools for discussion and collaboration among students are employed. For example, newsgroup, guest book and discussion forum are adopted. Instructors may create a general discussion forum or specific topics to be debated that makes the learning activities more fruitful through student-teacher interaction.

4 Phases of development

This project comprises four phases.

Development and planning

The initial phase focussed on hardware infrastructure, setting up of software configuration, network connection, traffic and loading testing, security control method such as user authorization etc., Existing Web-based learning system were also installed, tested, compared and evaluated, examples included Learning Space, WebCT, Blackboard, etc.

Designing and testing

Course content design and the adoption of appropriate instructional delivery approach are crucial elements to the success of Web-based learning system. In this phase, different subject specialists in the Department of Information and Applied technology were invited to participate in the content design. Subjects included Information Technology, Home Economics, Business Studies and Design & Technology. Overall testing was also carried out in this phase including log on procedures, security control, database maintenance, statistics, Web-survey and evaluation etc.

Implementation

The system is opened for use but limited to specific courses level, which have been developed at the design phase. Formative evaluation will also be carried out to record

- feedback from both teachers and students.
- System stability
- Continuous modification and improvement on the content courseware design

Evaluation

As the Web can be globally been assessed, the use of formative evaluation is very critical where a single error will distribute world widely. An empirical approach will be adopted aims to observe effects on students and teachers using both quantitative and qualitative methods. This is an on-going process from the beginning till the end of the project. A variety of instruments will be employed, some important areas to be concerned are:

- Background study - Students and Teachers perceptions towards web-base learning
- Structure and in-depth interview – to obtain opinions from user point of view on web-based learning
- System analysis – a formative evaluation on the whole system concerning
    - the learning effectiveness
    - effective instructional design strategy
    - effectiveness on computer-mediated communication

5 Conclusion and future research

Information Technology develops at a rapid rate. The advancement of technologies provides new opportunities that never be achieved in the past. In particular the integration of multimedia technology and a new mode of communication using network technology that are greatly differ from our tradition. Brown (1999) states that there will be no doubt that the Internet is a major force in reshaping the nature of school. As the nature of Web-based system is open and flexible, the Web technology still has lots of potentials that can be contributed to education, especially in course design and development. On the other hand, the application of Web-based learning systems are continually to grow, it suggests future directions for educator and researcher to investigate how this new learning technology can contribute to along with educational and learning theories.

The initial phase of this project is to build up a platform for web-based learning systems. Extended future research will mainly focus on evaluation of such systems in enhancing teaching and learning effectiveness and its contribution to instructional strategy.

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Development of Japanese-English, English-Japanese Conversation System with Voice Reading and Machine Translation

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1 Research Background

In recent years, the internationalization of Japan has attracted many foreigners. But, in the present state we have seen mostly people are shy to speak to foreigners because they cannot speak foreign languages. Again, there are many attempts that enable one to communicate on the Internet. In a preceding research, there was an attempt to add word translation to word chatting function (refs.[1]). Besides in any communication plurality of media help in the understanding (refs.[2])(refs[3]). For example, there was another preceding research that showed that listening along with subtitling in the same language help understand the content in the foreign language education (refs.[4]).

2 Research Objectives

In this research, therefore, we have developed a conversation system, which uses machine translation and text reading in the networking environment. This system uses machine translation, which enable people to communicate between two different languages. And, it fulfills text-reading function of chatting to help understand conversation contents

3 Developmental Environment

This system is developed with "Microsoft VisualBasic 6.0". The Japanese-English translation engine of this system used "LogoVista E to J ver 5.0 "and the English-Japanese translation engine used "LogoVista J to E ver1.1". Japanese Voice synthesis engine is "IBM ProTalker 97", and English Voice synthesis engine is Microsoft Agent.

4 Outline of Developed System

In this system, when we input Japanese or English, we can get Japanese text or English one and its rendering text and voice synthesis of its rendering one.
The steps from the text input to the translation, and the voice output is shown as follows.
(1) Sentences, which the client inputs, are passed to the server.
(2) These sentences are then passed to the translation engine, and the server translates in English in case of

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Japanese input and vice versa.

(3) The server sends translated sentences to both client and the other party.

(4) Translated sentences are indicated after input sentences on the receiver side, and translated sentences are displayed along with basic input on the other party side.

(5) If translated sentences are in Japanese, its voice output is given using "IBM ProTalker 97"(refs[5]) If it is English, then the output is given using "Microsoft Speech API"(refs[6])

5 Evaluation Experimentation

Three pairs consisting of one Japanese speaking person and one English speaking person were considered and experimented on the different setup. Type one is not using machine translation. Type two is using machine translation. We administered a free response type questionnaire for collecting data regarding the feeling of the participants during the different sessions. From the result the interest concerning learning of foreign language came up, and the participants' opinion of being able to take part in the conversation, not being aware of talking with foreigners using machine translation, were very positive. The pictures dawn by subjects with two different conditions are shown as the follwing.. The condition with word chatting not using the machine translation module. The left picture shows the picture which the sender want to send, and the left drawings shows the picture drawn by the receiver with the above condition.

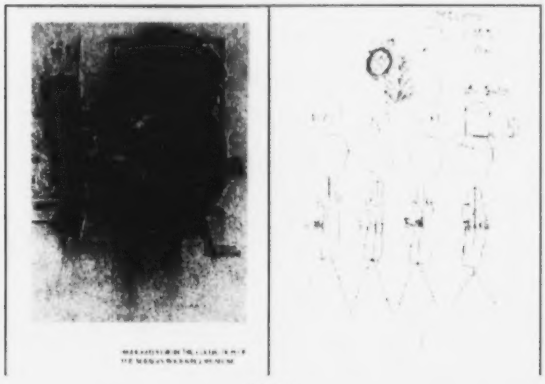

Fig.1

The condition with word chatting using the machine translation module. The left picture shows the picture which the sender want to send, and the left drawings shows the picture drawn by the receiver with the above condition. We can compare two pictures drawn by the receiver under the two conditions. As a result, we may roughly estimate that the picture using the machine translation module shows more precise information than the picture without the machine translation. As the above differences are based on a quite subjective judgment, it is not conclusive. Though the difference seems to be apparent from the view of quantities of sending information, we can't find the specific reasons caused the differences. The system developed with the chatting using the translation module will work effectively, especially to the persons who want to communicate each aother.

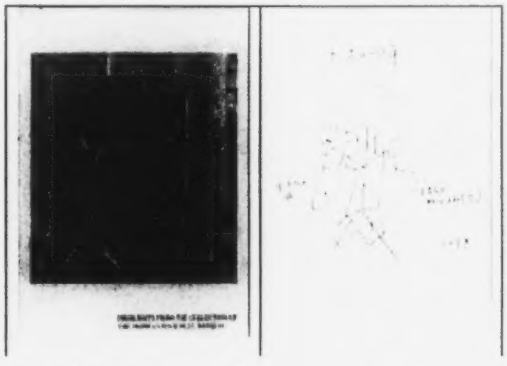

Fig.2

6 Future Works

We are now planning to expand the scope of speech recognition system as the future works. We have been introducing the speech recognition module to our system, and we are now evaluating the effectiveness of the speech recognition module to enhancing the communication.

Acknowledgement

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The Gathering and Filtering Agent of Education Newspaper for NIE

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This paper presents the ENIG Agent to gather distributed information of educational newspaper in the web as well as student to provide the sound information for the NIE learning. The ENIG Agent gleans an appropriate newspaper headline of educational news portal site for real-time provision of the information. For gathering the optimized information, The ENIG agent performs the pre-process of educational news site, information noise filtering, pattern matching. The gathered educational newspaper information is removed a harmful data by using the pattern matching in the inference engine. The student can show the result of sound data through the web-browser as well as can use to learning with another application. For efficiency of this system, we evaluate the performance of the ENIG system by the experience of the NIE learning.

Keywords: **NIE, Newspaper Information gathering, Intelligent Agent, Supervised learning**

1 Introduction

These days, the web brings about a great change of education by a rapid growth of the Internet. It is not an easy work that a student finds the education information in the web. For searching the suitable information, a various search engines were developed and it provided a service for all. However, the general search engine is not fit that a student use at learning directly, because the information of search engine can contain a many data unconcerned learning. The learning requires the filtered information that can apply learning directly. Therefore, for efficient education, new type of search engine needs for the information retrieval and gathering [9].

Besides, the NIE means "Newspaper In Education", it is a method that student and teacher increases an efficiency of learning by using newspaper. The late web is used a good place for the NIE learning and a collaborative learning. However, when student and teacher study on the NIE learning through the web sites, they spend much time and repetitive efforts to find the newspaper contents. The student can lose a basic purpose of the NIE learning by the wasteful spending. The NIE learning needs an intelligent searching agent that searches automatically an important content about newspaper on the web. Moreover, because the gathered educational newspaper can contain harmful data, the data can remove by using the pattern matching in the inference engine [8].

Consequently, this paper describes about the ENIG Agent for the NIE learning. For providing the student just wants newspaper contents, we designed and implemented the intelligent agent system. In the following section, the NIE and the agent for information retrieval will be surveyed and the basic structure of the ENIG Agent will be designed. Furthermore, the next section will be discussed about implementation and experiment of ENIG Agent system. Finally the conclusion and future works will be described.

2 NIE and intelligent gathering agent

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The NIE is the initials of 'Newspaper In Education'. It is the education method for individual who make friend with newspaper and improves the achievement of learning using the contents of newspaper. The newspaper, "a living text book", is applied with open education through the NIE learning.

Roles of newspaper for education are listed below [5].

- The newspaper is a bridge that can connect the disparity gap between school and society.
- The newspaper is the reflective of actual world.
- The newspaper reappears the scene of the history and is researching material of present society.
- The newspaper is the most suitable of clear text model and is used with subject matter of language learning.
- The newspaper is the unique textbook that everybody can read in ones lifetime continuously.

For the reasons stated above, we can expect a advantages that the NIE learning is originality, thinking power, ability to read and understanding and writing text, the establishment of sociality through ones sense of values, ability to practical use of information and so on[8].

When teacher will teach using NIE content on the web, we must consider below list.

- The newspaper is not be made data for the NIE. Because it is made for adult, it has a very difficult vocabulary. Therefore, teacher must supply to student a vocabulary database.
- The newspaper has an article about negative contents of society. Such contents must be edited or deleted by using an intelligent agent.
- Because the web is opened to everyone, the newspaper may have contents that student never see. In special, an article of obscene, crime, violence must be deleted.
- The contents of a newspaper are best the events of the day. But the NIE is used the contents of old newspaper. Such contents are good saving at scraping DB.

The method of information retrieval is variety. For information retrieval of educational homepage, intelligent agent used a very suitable tool [9]. The intelligent agents having the characteristics of autonomy, social ability, reactivity, pro-activeness and cooperative relationship can provide the searching results of a user demanded through machine learning [11].

An agent gathers information instead of the user. Because the agent system does not deal with basic data, instead it deals with knowledge information, can easily process the knowledge of education homepage. Moreover, an agent system is capable of using effectively gathering of information on the dynamic web environment. Therefore, the web based instruction using the NIE learning needs intelligent agent system [3].

3 ENIG System

Generally, the web document has many added tag information in contents. This added tag can represent efficiently information and data of HTML document. However, the user does not use the tag information but can use only the text or the multimedia information. The tag information treats only an unnecessary noise to users. If an unnecessary noise tag in a content is removed, the filtered document is translated a regular expression in the ENIG system. The pattern of information is extracted at transforming regular expression by the string matching method.

The extracting information of content is interpreted the accuracy of information by inference engine. Inference engine has the knowledge base augmented with a rule-based system, and it has function of learning and inference by a supervised learning.

3.1 Structure of the ENIG agent system

The structure of the ENIC Agent system is shown figure 1. This system consists of four parts. The document of homepage on web filters tags by the noise-filtering module in analyzer. The information of filtered document is translated from HTML document into regular expression. The regular document is matched with the string pattern provided by string matcher in an agent and it extracts the information of articles in educational newspaper. The information of an articles is removed harmful data by the knowledge base in an inference engine. The interface module consists of two screens. The rule and knowledge is edited and added, deleted through the knowledge manager and gathering information is supplied to student by using the result viewer. The learning environment is a learning space that studies the NIE learning through web browser and a learning application programs.

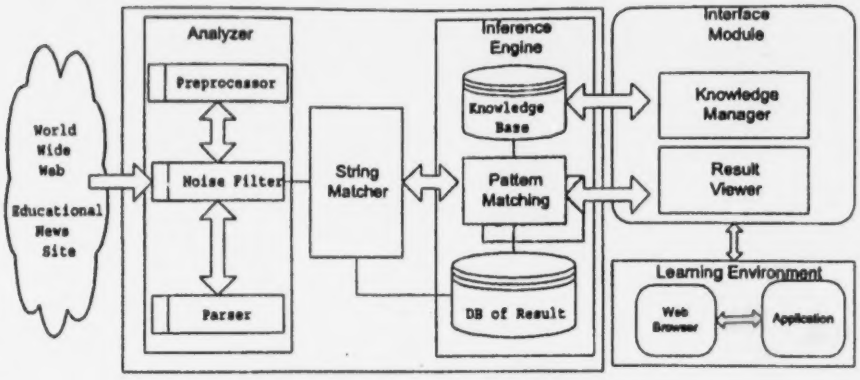

Figure 1. Structure of ENIG Agent

3.2 Noise filtering

Figure 2. Homepage of educational newspaper

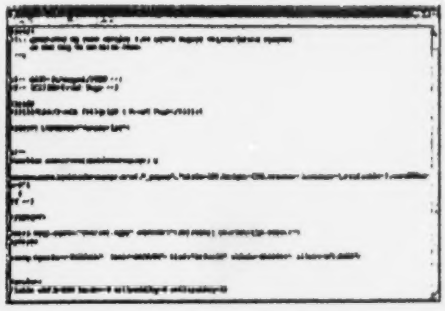

Figure 3. Source of homepage

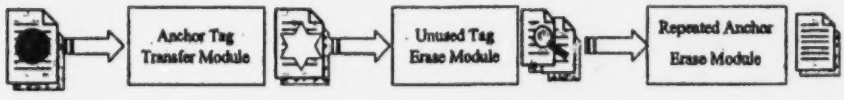

Figure 4. Steps of noise filtering

The example of educational newspaper site is shown figure 2. The tag information is not shown to user on the web-browser. While, the source of newspaper homepage is shown figure 3. The source is represented with a text and a complex tag information. Such tag information represents the arrangement of a document data and a multimedia information, a hyperlinked information.

The noise filtering is used to remove duplication data or an unnecessary data. For processing data called by HTTP, the noise filter processes work that removes a useless portion of the input data. The tags of HTML document have an irrelevant information to user, because tags only represent the formation of homepage and information of hypertext.

The noise filtering of the ENIG agent system removes an unnecessary tags in the document of an educational newspaper homepage except <A>...</A>tag, anchor tag of hyperlink and text data. The HTML sources are a difficult document to process noise filtering unconditionally, because the tag of document includes important information for the contents of document. Therefore, the noise filtering work must require a preprocessing module. Three steps of the noise filtering work is shown figure 4.

The preprocessing work for the noise filtering converts from basic <A>…</A> tag into suitable information and the works is listed below.

- Convert relative path for absolute path
- Change the URL of ASP form for the URL of HTML form
- Convert the path of CGI for general HTML form
- Change the path of script for absolute path
- Convert the hyperlink of image for absolute path

At the next step, the preprocessed documents are removed unnecessary tags by the noise filtering method except following items. <TABLE>,<TR>,<TD>,<LI>,<P>,
 tags are necessary the tags to keep the information of documents. The HTML document is composed one line of text or a record of table by such tags. Because most results of searching are represented with form of list or table, such tags is very an important information and may be not removed.

The final step of noise filtering is a work that gets rid of the duplicate from the URL of a document. The filtered document of educational newspaper homepage is show figure 5. We can know that the filtered document is ease for content analysis upon deletion of an unnecessary HTML tags. The advantage of noise filtering is that, it can process the same analysis about another newspaper homepages through removing tag.

```
Newspaper=Electronic Telegraph
URL=http://www.telegraph.co.uk:80/et?ac=003278937115627&rtmo=3mmquqwM&atmo=3mmquqwM&pg=/
title=updatednews
date=2000.8.14
<table>
<tr>
<td>
<a>
href="http://www.telegraph.co.uk:80/et?ac=003278937115627&rtmo=fqqM3Mas&atmo=HXp8RRpL&pg=/et/00/8/14/
nhon14.html"
Honda to double British factory output
</a>
<a>
href="http://www.telegraph.co.uk:80/et?ac=003278937115627&rtmo=fqqM3Mas&atmo=HXp8RRpL&pg=/et/00/8/14/
njake14.html"
Boy, 5, vanishes on trip to beach
</a>
<a>
href="http://www.telegraph.co.uk:80/et?ac=003278937115627&rtmo=fqqM3Mas&atmo=HXp8RRpL&pg=/et/00/8/14/
wiraq14.html"
West's raids spark Iraq fury
</a>
<a>
href="http://www.telegraph.co.uk:80/et?ac=003278937115627&rtmo=fqqM3Mas&atmo=HXp8RRpL&pg=/et/00/8/14/
npaed14.html"
Labour welcomes Hague's paedophile plans
</a>
<a>
href="http://www.telegraph.co.uk:80/et?ac=003278937115627&rtmo=fqqM3Mas&atmo=HXp8RRpL&pg=/et/00/8/14/
wthai14.html"
Murder hostel was notorious for drugs
</a>
```

Figure 5 Result of a noise filtering

3.3 Pattern matching

The filtered document is translated from each information and data into regular expression. The pattern of regular documents is extracted with sequence of regular expression by the method of string matching. The hyperlink information of image may infer by using the pattern matching through regular expression, because the hyperlinked image do not contain the text information on hyperlink. The pattern matching is executed to extract text data and information of hyperlink in HTML documents. Specially, if image has been including hyperlink, the pattern matching is a very important work. The article information of the educational newspaper site has information of hyperlink as followed.

*< a href= ……> …… text …… *

Generally, the hyperlinked text information exists between <a> tag and tag. If an image exists between the anchor tags as " <img src=…> ", then text information can exist at front or back of the anchor tags. In this case, each tag and the text information is changed the defined tokens previously. In addition, each data is created a string of a regular expression by the pattern matching.

The portion of tokens for creation of regular expression is shown table 1.

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Table 1 Token for regular expression

<table>	</table>			<tr>	</tr>	<td>	</td>	<a>		href	text
T	T	P	p	R	r	D	d	A	a	H	M

If the filtered document is represented with regular expression by tokens of table 1, the content of figure 5 is converted a tag page into the sequence of the alphabet as "TRDAHMaAHMaAHMaAHMa…". And the string pattern of regular expression has the process of pattern matching. This study used the three types of pattern for pattern matching as followed.

- *"AHMa" : "< a href= ……> …… text …… "*
- *"MAHa" : "… text … <img src=…> "*
- *"AHaM" :" <img src=…> … text …"*

The extracted string by pattern matching restores to the original tag and text information in HTML document. The extraction strings are reverted with source records. Figure 6 shows result that article is extracted through pattern matching of regular expression.

The translation of regular expression and the pattern matching have a many advantages. The advantage of pattern matching method is that the complex matching of string can extract only one time by matching of substring, and that agent can easily learn the rule of pattern.

Therefore ENIG system eases the addition of new educational newspaper site and pattern by the addition of URL and the type of pattern.

Electronic Telegraph|updatednews|2000.8.14|Honda to double British factory output|http://www.telegraph.co.uk:80/et?ac=003278937115627&rtmo=fqqM3Mas&atmo=HXp8RRpL&pg=/et/00/8/14/nhon14.html
Electronic Telegraph|updatednews|2000.8.14|Boy, 5, vanishes on trip to beach|http://http://www.telegraph.co.uk:80/et?ac=003278937115627&rtmo=fqqM3Mas&atmo=HXp8RRpL&pg=/et/00/8/14/njake14.html
Electronic Telegraph|updatednews|2000.8.14|West's raids spark Iraq fury|http://www.telegraph.co.uk:80/et?ac=003278937115627&rtmo=fqqM3Mas&atmo=HXp8RRpL&pg=/et/00/8/14/wiraq14.html
Electronic Telegraph|updatednews|2000.8.14|Labour welcomes Hague's paedophile plans|http://www.telegraph.co.uk:80/et?ac=003278937115627&rtmo=fqqM3Mas&atmo=HXp8RRpL&pg=/et/00/8/14/npaed14.html
Electronic Telegraph|updatednews|2000.8.14|Murder hostel was notorious for drugs|http://www.telegraph.co.uk:80/et?ac=003278937115627&rtmo=fqqM3Mas&atmo=HXp8RRpL&pg=/et/00/8/14/wthai14.html

Figure 6 Example of string exchanging for regular expression

3.4 Inference and learning method

The extracted newspaper information is not provided all good information to student. In case of an inserted advertisement site, such site can become an obstacle of learning by the useless content. Moreover, a negative content or a harmful page too must be not suitable site to student. Such sites can be provided about a lustful content and a crime, an slang, a violence and so on. The harmful data can be removed in advance learning by inference engine and knowledge base. Reasoning rule uses the rule-based production system. The representation of knowledge is shown below

IF A THEN B

The production system has a merit that it is simple and easy the representation of rule as well as the addition of knowledge. The learning method of the ENIG Agent system uses the supervised learning learned by human teacher. If new rule is occurred, teacher input new rule and knowledge in knowledge base. For example, if the extracted information contains harmful text as a sex and a narcotic, a knife, then teacher input new rule and knowledge as "*IF sex AND narcotic AND knife THEN delete*".

The harmful site at gathering site reason a rule by the analysis of content and the rule are stored in knowledge base by teacher. The bad information of extracted document is removed by the vocabulary DB and the rule of knowledge base. For forbidding the access of the student, the addition and deletion of rule and fact in the knowledge base can be control only by a teacher.

4 Implementation and Experiment

The implemented ENIG Agent can extract only the important information of newspaper site. In addition, it can be had with only a text and URL information at various homepage. For implementation of the ENIG Agent, we used Visual C++ and the CLIPS DLL. The CLIPS is rule-based a production system shell and it is used as an inference engine.

The execution screen of the ENIG agent system is shown figure 7. The ENIG system is composed of three parts. The left side of the screen is a part that the directory manager manages and edits educational newspaper sites, and the mid-screen is a part to view the result of the gathering information, and the button of right above is part to add a rule for inference and machine learning. If 'gathering' button is clicked, the ENIG agent gathers and extracts an article from an educational newspaper site. If 'learning' button is clicked, a rule and knowledge is added and edited by teacher in the ENIG agent.

This ENIG agent system can be applied directly at the homepage of different domain without change of system. If site is constructed standard HTML document, an agent can search and gather even the document of a foreign site.

The applying example of NIE learning using the ENIG system is shown figure 9. This example is used the ENIG system and the Web Browser and word processor. The screen is the NIE learning about music using the ENIG agent system and the Window application. The information of newspaper on the web can be applied directly at a web-based instruction (WBI).

One of the advantages of this system is that the extracted information uses a mobile environment directly. Because the extracted information is very small data and hyperlinked information, such data can be inserted the mobile communication as a cellular phone, a PDA, a notebook computer, a portal computer, and so on. Furthermore, the information of this system can transmit the WML by WAP.

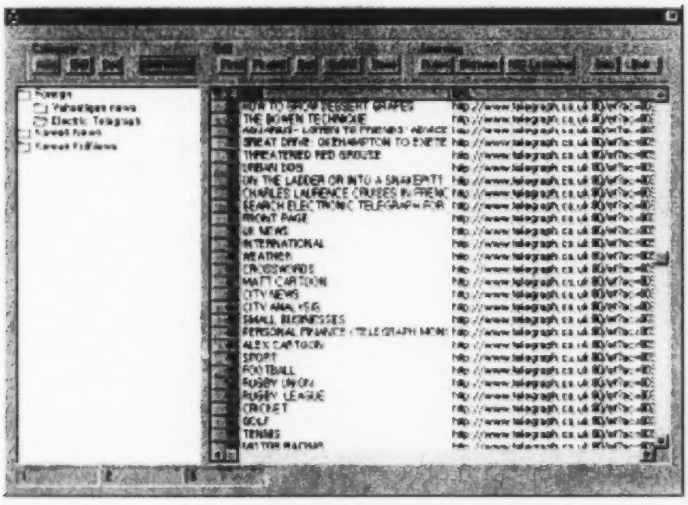

Figure 7 ENIG Agent system

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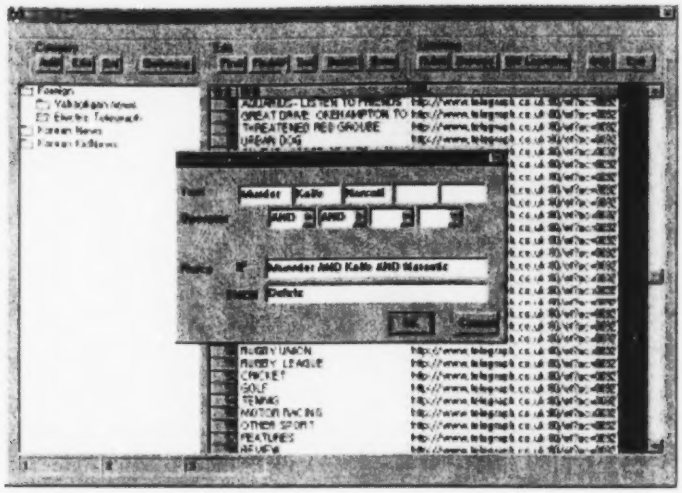

Figure 8 Addition of knowledge

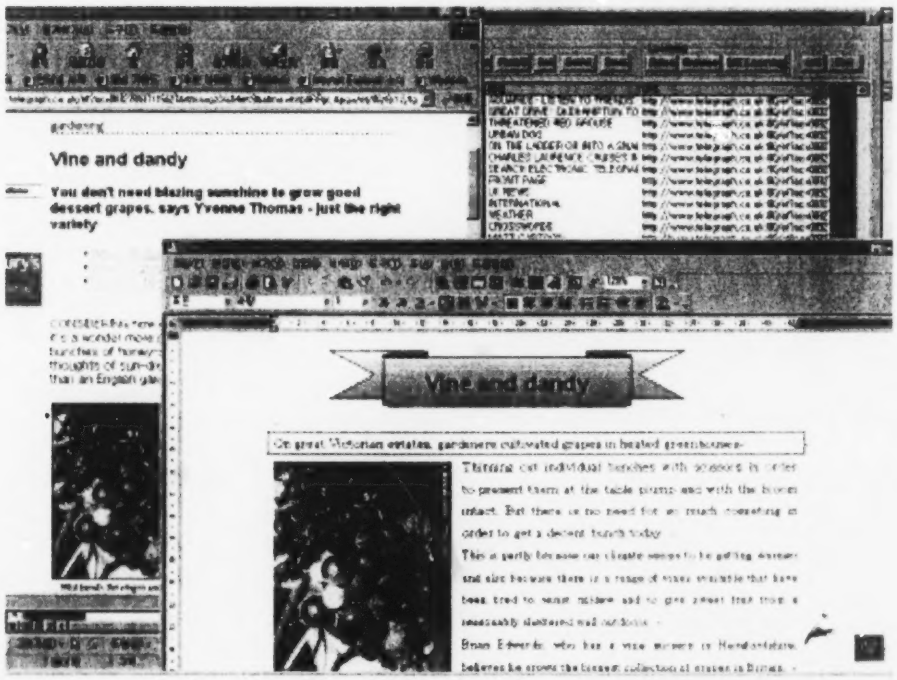
Vine and dandy
You don't need blazing sunshine to grow good dessert grapes, says Yvonne Thomas - just the right variety
Vine and dandy

Figure 9 Example of NIE learning using ENIG agent

5 Conclusion and Future works

As mentioned above, we described about the ENIG agent system for the gathering information of educational newspaper homepage. In addition, we designed the method of noise filtering and pattern matching for suitable information. The method of noise filtering was used to remove unnecessary tags at source of HTML document and the method of pattern matching was used to extract necessary URL and text

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information. The learning of agent was used to provide with good information to student by supervised learning. Most a web-based instruction was mainly learning about information retrieval. As student spent a lot of time to find learning information and data, so these lead deficiency of time for the essential learning.

Consequently, the ENIG agent system can provide not only to student for the learning of information retrieval but also can help them capturing the genuine NIE learning. And this system can execute the role of information treasury for the whole education through scraps of information.

The future works are that we improve the faculty of agent for information gathering of all sites; moreover, we need research about unsupervised learning of agent and not supervised learning. In addition, we need research to remove gathering information of header and footer through addition of heuristics and pattern type that requires the study about the method of keyword searching it. Finally, for providing a location of information to the agent, we will research the extension method of URL.

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Integrating Electronic Mail Systems in Computer Literacy Instruction: Its Impacts on Student Attitudes and Interpersonal Relationships[1]

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The effectiveness of e-mail, as a supplementary instructional aid to computer literacy class and as a communication link between and among instructors and students, was explored in this study. More specifically, the effects of e-mail utilization in classrooms on student attitudes toward the instructor, the class and interpersonal relationships were the focus of the study. In total, sixty-eight prospect teachers enrolled in "Computers in Education" course participated in the study for a whole semester. Results from the study provided substantial evidence supporting e-mail's facilitative effects on student attitudes toward the instructor, the class as a whole, and other classmates.

Keywords: **Attitudes toward the class, Computer literacy instruction, E-mail, Interpersonal-relationships.**

1 Introduction

With unique characteristics like faster and asynchronous communications, greater flexibility for participant time management, improved receiver control and use of the message, and cost savings, etc. electronic mail (hereinafter named e-mail) is becoming more and more common in contemporary organizations [8, 12, 22, 24, 31, 33, 36]. In views of many of its advantageous features over conventional communication modes, e-mail has presented itself as a promising instructional and learning tool since its advertent.

Despite its potential value in variant educational settings, substantial evidence has come mostly from studies done in the areas of communication, literature and language learning [1-6, 9-21, 23, 25-30, 32]. For instance, Marttunen & Laurinen (1998) using e-mail as a forum for argumentation and debate supported the idea of incorporating the media for critical thinking and argumentation skills [19]. Whipp (1999) integrating e-mail discussion activity in an undergraduate methods course found that e-mail activity promoted reflection and joint interpretations of field experiences among participants [32].

Studies focusing on intercultural communications further stressed the multicultural learning opportunities e-mail engendered. For example, Cohen & Miyake's 1986 study showed that joint participation in the e-mail interaction across cultures could encourage multilingualism and awareness to other cultures [4]. Results from Ma's study (1993) indicated that students participating in the international e-mail communication tended to be more open of sharing information that provided them with subject and cultural knowledge [18]. Ruhe's endeavor (1998) in creating classroom e-mail exchanges among college

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preparatory English-as-a-Secondary students scattering around different continents again demonstrated that e-mail could be effective in teaching intercultural awareness [23]. Numerous scholars, on the other hand, focused on exploring and actualizing e-mail's educational potential for the teaching of writing and composition [1-3, 5-6, 10-11, 16, 25-30].

Though e-mail, as an instructional aid, has been claimed to provide students with greater access to faculty and peers, the impacts of e-mail systems on student attitudes toward the instructor, the class as a whole as well as interpersonal relationships severely fall short of empirical research basis at the present time. Thus, the present study focused on determining the value of e-mail communication in enhancing participant affect and social gains. The major purpose of the present study was to investigate the effectiveness of e-mail, one of the most accessible, convenient, and easy to use computer-mediated communications, on student learning outcomes. By incorporating e-mail into the instructional process, and inviting on-line communications both between and among instructors and students throughout the semester, the researcher expected to observe the differential effect e-mail has on student attitudes toward the instructor, the class and their classmates.

2 Methods

2.1 Participants and learning context

Two classes of students from "Computers in Education" course (N=68) participated in the study. The course was offered in 1999 semester year under a teacher preparation program in a National university in Southern Taiwan. The course was introductory and selective, aiming to strengthen prospect teachers' computer competency. Student self-introduction held at the first class session revealed that most students possessed only fundamental computer skills, had limited exposure to computer-mediated communication, and had not experienced e-mail utilization within class in the past. Additionally, as the course was offered during the Fall semester, most students were new to each other and had not taken the instructor's class before.

The study was conducted in a university computer laboratory with fifty computers designed for individual student learning. A Classroom Broadcast System was installed to network student workstations in the computer lab to further facilitate teaching and learning. During each class session, the instructor would give an overview of today's topics, explain and demonstrate the procedures involved in operating different computer applications and functions, which were interspersed with student hands-on practice. E-mail together with basic operation systems, word-processing, spreadsheet, computer-generated presentation using PowerPoint, and web-surfing techniques were taught by the same instructor in a one-semester two-credit course.

Two performance-type posttests were designed to assess student skills on operation systems, e-mail, word-processing and spreadsheet. A group-based final project of any topics of student choice was used for web-surfing and PowerPoint skills assessment.

2.2 Experimental design and treatment conditions

As most participants from both classes possessed fundamental computer skills and were acquainted to neither each other nor the instructor, a posttest-only experimental design was adopted in the study. To examine the potential effects of incorporating e-mail systems in a classroom setting, two participating classes were randomly assigned to different treatment conditions, namely, the e-mail utilization condition and the traditional condition. Prior to the commencement of the study, students were required to obtain a university e-mail account. A 2-hour class session was designated for e-mail instruction and practice. Procedures for sending, receiving, reading, responding, forwarding, printing, and deleting mails as well as e-mail features like address-book and attachment were explained, demonstrated and practiced in the class.

To examine the effectiveness of e-mail, as a supplementary instructional aid to computer literacy class and as a communication link between and among instructors and students, all instructional components and procedures were kept essentially the same except the way in which supplementary materials were disseminated to students and student assignments were handed in. In the e-mail utilization condition, instructors send out supplementary materials including weekly course outlines, additional reading materials, announcements, and computer-related news updates (e.g., newest computer virus) via e-mails at least two

days ahead of meeting time. Moreover, students were requested to hand in all their assignments/reports electronically and were encouraged to use it for future correspondence with the instructor, their teammates, and other classmates. As e-mail was treated as a supplementary channel to the class, no compulsory measures were taken to force students to use e-mail except those mentioned. Nevertheless, students were strongly encouraged by the instructor to log in the system at least once a week to check mails and print out any materials they deem useful. As mentioned previously, a group-based project gearing toward integrating Internet resources for any instructional topics of group choice was designed as the second evaluation component of the class, students were encouraged to take advantages of e-mail systems to communicate with their self-chosen teammates along the way. By opening up on-line communications both between and among instructors and students throughout the semester, the cultivation of elevated attitudes toward classmates, the instructor and the class was postulated.

In the traditional group, on the other hand, students would receive essentially the same supplementary materials in class and would hand in assignments directly to instructor, only that they were in hardcopy format. In other words, after the instruction on e-mail systems and functions, the instructor did not intentionally integrate e-mail utilization into the instructional process to further promote computer use. One last thing, performance-type posttests on e-mail ascertained that students in both treatment conditions mastered the skills.

2.3 Measures

A post-session self-report questionnaire administered individually at the last session of the class was used to collect data pertaining to the effects of integrating e-mail on student attitudes and interpersonal relationships. The 9-item "Class Evaluation" developed by the university was used for the measurement of student attitudes toward the instructor and the class as a whole. Sample items included, "the instructor was prepared and the instructional content was appropriate; the instructor was available to discuss academic matters with students both in and out of class and could explain things in a clear fashion; the instructor's attitude toward teaching was diligent, and the instructor was responsible and punctual." The 13-item "Perceptions Toward Teammates Scale," developed by Yu (1996-97), was used to test the hypothesis relevant to student perception toward their teammates [34]. Sample items included, "I am willing to work with my teammates again next time; I liked my teammates." Finally, the 11-item "Perceptions Toward Other Classmates Scale," developed by Yu (1996-97), was included to test the hypothesis relevant to student perceptual impressions of other classmates. Sample items included, "Other classmates helped me greatly with respect to my learning; other classmates were friendly." The internal consistency reliability (coefficient alpha) for student perceptions toward their teammates and other classmates was .92 and .86, respectively.

Each statement on the questionnaire was rated on a five-part discrete scale, with corresponding verbal descriptions ranging from "strongly disagree" through "disagree," "no-opinion/average," "agree," to "strongly agree." Each response received a weight of 1, 2, 3, 4, or 5, respectively. To counteract possible response-set tendencies, both positive and negative statements were included. Scoring on the negative statements was reversed so that negative and positive responses could be summed and averaged with higher scores reflecting more positive attitudes.

3 Results and discussion

Data were analyzed using the analysis of variance technique on student attitudes toward the instructor/class, their own teammates and other classmates. A .05 level of significance was adopted for use in this study. The means and standard deviation (SD) values for each of the dependent variables were listed in Table 1.

Results from t-tests showed significant differences between the two treatment conditions in student attitudes toward the instructor/class, $F(1, 66) = 2.898$, $p < .01$, and student attitudes toward other classmates, $F(1, 66) = 2.033$, $p < .05$. However, data analysis did not show significant differences between the two treatment conditions in student perception toward their own teammates, $F(1, 66) = 1.476$, $p > .05$. The results further showed that subjects in the e-mail utilization condition tended to rate the instructor/class and other classmates more positively than those in the traditional group.

Table 1: Descriptive Statistics of Different Treatment Conditions on Subject Attitudes Toward the Instructor/Class, Their Teammates, and Other Classmates

	Integrating E-mail Group (N=35) M (SD)	Traditional Group (N=33) M (SD)
Attitudes Toward the Instructor/Class	43.3605 (2.8042)	41.0303 (3.7800)
Perception Toward Their Teammates	57.7940 (6.2625)	55.3747 (7.3470)
Perception Toward Other Classmates	45.1944 (5.4867)	42.7273 (4.4880)

Data from after-session debriefings with participating students combined with sample e-mails both sent and received by students supported the idea of integrating e-mail systems into the learning process. While some students did take advantages of e-mail systems to ask academic-related questions (e.g., procedures for a specific application functions not covered in class, deadline for assignments, etc.) and/or send social greetings during holidays, the majority of e-mails transmitted were forwarding mails of variant topics ranging from health-related issues to jokes, novels and updated news in the technology world, etc. Many students pointed out that e-mail's distinct features like forwarding and address-book immensely facilitated interaction and information sharing among classmates and the instructor. Most students developed the habit of logging in the systems to retrieve e-mails along the way. Through increased interactions among the participants via receiving a wide array of articles and useful information forwarded from classmates and the instructor, mutual understanding, acceptance and bonding thus fostered. Thus, it was reasonably why students in e-mail conditions tended to view the instructor as better prepared, easier to locate, and other classmates as friendlier and more helpful.

Though the non-significant results in student attitude toward their own teammates was somewhat surprising at first, a closer look at e-mail use pattern among teammates shed some light onto the issue. E-mail was introduced into the learning environment in an attempt to facilitate group interaction within team-members; however, students in the e-mail treatment group rarely used this channel for online discussion and primarily as a last resort for scheduling purpose with their own teammates. As most group members sat closer to each other during the class and arranged meeting time for final project discussion right after class sessions, they didn't find e-mail especially useful in that aspect. As students did not use the technology for inner group communication except under very extreme situations, the fact that e-mail's integration into the learning environment did not significantly influence subjects' attitudes toward their teammates was understandable.

4 Conclusions

This study focused on examining whether incorporating e-mail into computer literacy classroom settings could positively influence student attitudes and interpersonal relationships. Results indicated that student attitudes toward the instructor/class and other classmates were positively influenced by this approach. The obtained results provided empirical evidence supporting the usefulness of e-mail as an aid for promoting out-of-classroom contacts of various types among faculty members and classmates, which, one way or the other, contributed to more positive attitudes.

Though e-mail might provide students with greater access to faculty and peers and seemed to enrich teacher/student interpersonal relationships in the present study, a word of suggestions for avant-courier was rendered. For e-mail to be effective as an alternative option for further two-way communication between teachers and students, all essential elements must be present. First, the important role "feedback" played during the process. Many students stressed that their willingness to continue having out-of-classroom contacts with instructors via e-mail was determined by the presence of the instructors' response in return. As Zaremba (1997) clearly pointed out "Without feedback, e-mail is likely to be less effective than it potentially could be. The quality of communication may be a function of the timeliness of feedback provided by the recipient." [35]. To create a bond of communication with students via e-mail, timeliness of feedback provided by the recipient would be an important task all participants need to attend to.

Secondly, for electronic communication to take effects, accessibility of essential hardware and software must be in place [22]. Some students mentioned specifically during the interview that limited access to computer hardware and network seriously prevented them from taking a full advantage of e-mail as a unique

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communication tool. To ensure ongoing communications among participants electronically, interested implementers cannot ignore measures overcoming equipment and facility shortage.

Finally, opportunities for training and familiarization of the system for all parties would certainly facilitate the integration process. Extra time, care and possibly some incentives may be needed not only to get students accustomed to on-line message exchanges but also to have students appreciate e-mails' advantages especially during initial exchanges. Only when all the essential components as mentioned were in place, many of the potential impacts e-mail could have on the instructional settings like liberation of traditional roles associated with different parties, and humanitarian learning environments for all individuals would thus be actualized.

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Network Usage Survey and Its Analysis with Related Factors between University Students and Occupational Groups in Taiwan

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This research was to investigate the current situation of computer network usage, frequency and purposes between university students and occupational groups in Taiwan. The research also analyzed the influences of its related factors on computer network usage, such as computer experience background, the attitudes toward computers, personality, aptitudes, critical thinking ability, academic achievement and so on. The subjects of university students were sampled from the Soochow University. The subjects of occupational groups were sampled from various occupations. The Computer Experience Background Scale and the Computer Attitude Scale were conducted by author for this research. Lai' s Personality Scale, Differential Aptitude Tests and Critical Thinking Appraisal are three published tests selected appropriately by the author and used for the research purposes. Academic achievement in the research was based on the students GPA.

According to the computer network usage of university students, 150 students were sampled in 1997. The network usage was classified into three types of purposes: (1) information searching, (2) BBS, (3) e-mail. The findings were that the students used computer network for searching information the most frequently, then for BBS, for e-mail the least frequently. Besides, the male students significantly used computer network more frequently than the female students, especially for the usage of information searching and e-mail purposes. About computer experience background and the attitudes toward computers, the students who have more computer experience background and who have more positive attitudes toward computers significantly used computer network more frequently where the influences from computer experience background was larger than the influences from computer attitudes.

Since the subjects from the university students can be arranged and administered by the Lai' s Personality Scale, Differential Aptitude Tests and the Critical Thinking Appraisal, and their GPA can be retrieved from the university, therefore, the relationship between computer network usage and personality, aptitudes or critical thinking ability were analyzed. The findings of the Lai' s Personality Scale were that the students who were more objective, less depressed, and less nervous significantly used computer network for information searching purposes more frequently. The students who were

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more social types of personality significantly used computer network for BBS purposes more frequently. The students who were more worry and distress significantly used computer network for e-mail purposes more frequently. The Differential Aptitude Tests was found that the aptitudes of arithmetic and abstract reasoning were significantly positively correlated with the frequency of computer network usage for BBS purposes. None of critical thinking abilities was significantly related to the computer network usage. The students' GPA was not found to be significantly related to the computer network usage either.

Since we sampled 110 university students for the same survey again in 2000, the changes of the computer network usage by time sequence were investigated in this research. It was found that no matter the usage of information searching, BBS, or e-mail purposes, the university students in 2000 have significantly more frequency in using computer network than the students in 1997. The university students in 2000 yielded significantly more computer experience background than did the students in 1997 too. However, for the attitudes towards computers, the university students in 2000 did not make significantly difference from the students in 1997. These results indicated that university students always respected the importance of computers in their lives. They significantly used computer network more and more by years. As a matter of fact, computer network will be the main tool to get survived in the future hi-tech world.

For surveying computer network usage of occupational groups, 115 adults were sampled in 1999. It was found that they significantly used computer network for information searching and e-mail more frequently than for BBS. No gender effect was found to be related to the usage of computer network. In addition, the more computer experience background the occupational groups have, the more significantly frequently they used computer network. However, their attitudes toward computers were not significantly related to the computer network usage. The results of age stages showed that the elder people significantly used computer network less frequently than the younger people.

General speaking, the occupational groups used computer network for e-mail purposes significantly more frequently but for BBS significantly less frequently than did the university students. The occupational groups significantly yielded more computer experiences than did the university students. It has to be mentioned here that since we sampled university students and occupational groups in different years, these results might confounded with the time effects. Further research and experimental design were suggested to verify these problems.

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Online ESL Learning: An Authentic Contact

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As communication via telecommunications become easier, learning through online technologies is made possible. In a telecommunications project among US preservice teachers and Taiwanese English as a Second Language learners, Taiwanese students practiced English language and discussed cultural information with US partners who served as online tutors. Data revealed that Taiwanese ESL learners perceived online learning of English language and American culture to be valuable for its authenticity. Instructions on intercultural communication skills were found to be necessary prior to the connection in order to help eliminate misunderstandings between participants of two countries. The success of online learning depended on several factors such as participants' motivation, participants' attitudes, technology, preparation, and support services. Furthermore, Taiwanese learners who had successful experiences applied ten strategies to their ESL learning. These strategies were employed during a circular process of online learning.

Keywords: **ESL, Online Learning, Telecommunications, Intercultural Computer-Mediated Communications**

1 Introduction

The purpose of this research was to investigate a telecommunications project for Taiwanese students to learn the English language and acquire cultural information through online technologies. Preservice teachers (PSTs) at a state university in the United States worked with Taiwanese learners of English as a Second Language (ESL) at a Taiwanese university. The goal of the research was to study intercultural online learning.

In Taiwan, many scholars have been discussing the need for educational reform and change of instructional methods [7][36]. One change under consideration is increased use of online instruction. Taiwanese researchers suggested that the educational reform should include the adoption of methods proposed in the West (i.e., the United States, Great Britain, Australia, and other English-speaking countries), such as involving students in active learning, teaching critical thinking skills, and incorporating individualized instruction [4][25]. Harasim (1990) and Owston (1997) believed that instruction could be enhanced by online teaching. They have stated that online instruction allows for active learning, idea generating, idea linking, and idea structuring as well as helps the students to develop skills in critical thinking and problem solving. Individualized instruction is supported because both synchronous and asynchronous modes of instruction are workable through technologies.

When online teaching is used as a language instructional method, it remedies Taiwan's geographical isolation as an island and provides opportunities for ESL learners to communicate in an authentic English environment. Successful second language (L2) learning includes not only knowing the linguistic features of the language but also understanding the cultural concepts [14]. Sayers and Brown (1987) remarked, "foreign language students

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need authentic contacts with native speakers and much practice in a range of language skills -- including reading and writing -- if they are to develop cultural awareness and communicative competence" (p. 23). L2 learners learn language and culture if instruction is facilitated by supportive individualized learning activities [13]. These activities must address the learner's current language level (Krashen's stage of i) and the level beyond the present language and literacy capacities (Krashen's stage of i + 1) [21]. Telecommunications can help overcome the limitations of Taiwanese isolation by providing for supportive and authentic language instruction.

2 Literature Review

Learning through telecommunications has evolved during the 1990s in the West and has proved to be successful [1][8]. To bring more applications into Taiwan, we need to first explore Taiwanese students' needs and attitudes in the use of such technology. Some scholars stated that Asian students employ different learning strategies than students in the West [17][32]. Cheng (1980) pointed out that the educational system in Taiwan has adopted many different educational methods developed in the West; however, utilization has been non-systematic and inappropriate for societal needs in Taiwan. Furthermore, Stewart (1985) and Dooley (1995) noted that the applications of educational technology in other countries besides the United States may be unsuitable because of cultural non-transferability. For instance, other cultures may value a different set of learning and teaching modes when compared to the United States, or they may have insufficient equipment for advanced technological applications. Taiwanese scholars have also urged that future investigations must be done specifically on distance-learning courses in Taiwan [6][37]. Therefore, close examination must be carried out prior to fully adopting new telecommunication technologies as learning tools in Taiwan.

As technology advances, communication over a distance and across cultures becomes easier and inevitable. However, very little can be found in the literature that addresses issues of online intercultural communication and the design considerations that would enhance such interaction. Lee (1999) urged designers and instructors of computer-based instruction to take cultural issues into consideration when developing learning environments and technology integration within curricula. Caution must be taken, especially when intercultural contacts occur in an online learning context, because communicators may not be who they seem to be online [28].

Collis and Remmers (1997) pointed out that to allow successful online cross-cultural contact, at least four issues have to be taken into consideration: communication and interaction, language, content, and representation form. First, communication and interaction are easily misinterpreted across cultures. According to the two researchers, more communication and interaction are not necessarily better than less, and well-structured communication may be preferable for wider audiences. Second, because language includes verbal and nonverbal cultural communication, those developing cross-cultural online instruction must be sensitive to cultural differences in communication styles. Third, designers must choose cross-cultural course content. Last, visuals can overcome problems associated with text-based language. However, one must be sensitive to cultural differences in the acceptability and interpretability of various aspects of visualization.

Research on online connections has been conducted in many areas during this decade. Projects connecting students with teachers or other students in multiple locations were implemented in many subject areas such as science [22], history [3], teaching [27], and language arts [35]. Similar projects in the area of foreign language learning are found in the teaching of Portuguese [20], Russian [30], Spanish [24], and ESL [19][33]. The results of these studies mainly stated how the participants at different sites benefited from the connection in increased technical competence, personal development, language improvement, and more meaningful cultural exchanges. No research has been found that explores the learning strategies used by students while learning a L2 online and the issues encountered during their online intercultural communications.

3 Purposes and Research Questions

There were three purposes of this study: first, understanding the Taiwanese ESL learners' perceptions of learning through distance technologies; second, exploring issues related to online intercultural communication; and third, identifying the learning strategies the Taiwanese learners employed during distance learning to accomplish the

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acquisition of ESL and understanding of American culture. The three research questions guided the study were:

(1) How do ESL learners in Taiwan perceive language acquisition and cultural understanding via distance learning technologies after the experience?
(2) What intercultural phenomena can be observed in online learning for Taiwanese students?
(3) What online learning strategies do the Taiwanese use while learning the English language and learning about American culture?

4 Method

This study employed a qualitative research design. This design enabled the researcher to inquire, comprehend, and describe the experiencing world of the participants and the meaning of these experiences [2][26].

4.1 Participants

The project involved students in two different countries: US and Taiwan. There were 40 PSTs in the United States who took either *EDTC 305: Instructional Technology: Theory and Practice* or *INST 462: Language Acquisition and Development* at a state university. These were PSTs being prepared to teach English, ESL, political science, and history at the elementary or secondary level. The same number of participants in Taiwan were students who study in the Department of English Language and Literature at a university in Taipei, Taiwan. They were members of *English Composition and Conversation* classes at either sophomore or junior levels. The US and Taiwanese students participated in this research because their instructors included this online connection project as part of their course requirement. The participants in the United States ranged from the ages of 20 to 22, while the students in Taiwan ranged from the ages of 19 to 20.

In addition, the three professors in Taiwan whose students were project participants were also involved as research subjects. They were interviewed by the researcher in regard to their students' perceptions of online experiences, students' improvement in the English language as well as other types of knowledge through the connection.

4.2 Procedures

To carry out the study, US PSTs corresponded with Taiwanese university-level ESL learners for ten weeks. These PSTs served as tutors of the English language and American culture. The participants in both countries were matched one-on-one randomly prior to the connection. They were also given instructions and orientations on the utilization of e-mail systems and on online learning/teaching. The PSTs were provided with a lecture, discussion, supportive readings, example tutorial correspondences, and a web site of resources. The web site included a downloadable lecture about online learning, the expected online correspondence process guidelines, a midterm survey, sample correspondence, and previous participants' reflections (http://www.coe.tamu.edu/~lcifuent/classes/edtc305/online.htm). They also read on topics such as effective facilitation of computer conferencing [9], computer-mediated communication [18], interactivity in online environments [15], online teaching strategies [8], and cultural differences in teaching and learning [17].

Similarly, the students in Taiwan were supplied with an orientation where the project is introduced to them along with rules and regulations. Sample correspondence, results of previous connections, and suggestions for online learning and discussion topics were presented at their departmental website (http://www.eng.fju.edu.tw/cultural_connections.htm).

Every participant received a welcome letter to encourage them to open themselves up to this new experience. The PSTs were given a rubric with expected number grades to help them accomplish the requirements for their part of the connection. The Taiwanese students initiated the connection by sending out their first e-mail message to their US partners. The US PSTs analyzed their student's language level and started to instruct him or her according to that level through e-mail.

Mid-way during the ten-week connection, the PSTs were asked to fill out an online midterm survey. In Taiwan, the students submitted a brief report to their instructors every two weeks to keep track of their connection progresses.

At the end of the connection, the PSTs and their Taiwanese students filled out a post-connection survey. The PSTs also handed in all of their e-mail printouts and personal journals that reflected their online teaching and learning experiences. Similarly, the Taiwanese students handed in their final reports to their Taiwanese instructors. Two weeks after the end of the connection, the researcher traveled to Taiwan to conduct interviews with 12 Taiwanese students and the three Taiwanese professors. The interviews included open-ended questions.

4.3 Data Collection and Analysis

There were eight data sources: (a) printouts of correspondence; (b) the PSTs' midterm survey; (c) the PSTs' post-connection survey; (d) the Taiwanese students' post-connection survey; (e) the PSTs' reflective journal entries; (f) the Taiwanese students' final reports; (g) transcripts of the interview with the Taiwanese students; and (h) transcripts of the interview with the Taiwanese professors.

Data analysis in qualitative studies is an ongoing process during the research; it is best done simultaneously with the data collection [26]. Each time data are gathered, information was analyzed using procedures proposed by Emerson, Fretz, and Shaw (1995). The steps included close reading, open coding, writing memos, noting themes and patterns, and focused coding.

5 Results

Data analyses revealed remarkable information on the areas of (a) learner perception, (b) intercultural communication, (c) factors affecting online connection, (d) online learning strategies, and (e) online learning processes. First, this particular group of Taiwanese ESL learners was positive about L2 and cultural learning in an online setting. The results of a post-connection survey showed that participants more or less agreed that (a) E-mail connections have a positive place in ESL classrooms (mean of 3.71); (b) the Web-connection has a positive place in ESL classrooms (mean of 3.51); (c) they would participate in another online connection if given the opportunity (mean of 3.58); and (d) they would suggest their other friends or classmates participate in a similar project (mean of 3.85) (see Table 1). Even though the response to the question "Overall, my connection was successful" was not very high (mean of 3.26), learners who had an unsuccessful connection held positive attitudes toward the project. One student wrote in her final report, "My pal does not respond to me so often. I didn't learn much through this project this semester. But that doesn't mean this project is not good. I hope school brothers or sisters can still have the chance to get in this project."

Table 1. Taiwanese Students' Responses Toward the Online Connection

Questions	M	SD
The **E-mail connection** has a positive place in ESL classrooms.	3.71	0.67
The **Web-board connection** has a positive place in ESL classrooms.	3.51	1.50
I would participate in another online connection if given the opportunity.	3.58	1.13
I would suggest other friends or classmate participate in a similar project.	3.85	0.78
Overall, my connection was successful.	3.26	1.07

Note. Participants responded on a 5-point Likert scale (1= Strongly Disagree; 5 = Strongly Agree). The survey was complete by 37 participants.

Second, intercultural communication issues cannot be ignored. A lot of Taiwanese learners interpreted that their tutors were angry with them when they did not receive messages over a week. In addition, learners read what wasn't intended in the messages. They constantly apologized to the PSTs for being an inconvenience. Several learners ceased active interaction with the PSTs due to these personal interpretations. The Taiwanese professors suggested that acquainting learners with different thinking patterns and expression styles is necessary in future connections.

Third, factors that affected online connections included participants' motivation, attitudes toward each other, participants' fields of experience, frequency and quality of interactions, technology, preparation, and support

services (figure 1). Any missing component would hinder the success of the connection. Other resources such as teachers, peers, family members, libraries, and web resources provided extra assistance to the participants.
Fourth, during the correspondences, ten learning strategies were found to be used by the learners in their messages. These were paraphrasing, translation, Q&A from tutor to student, Q&A from student to tutor, explanation, elaboration, decision-making, self-reflection, metacognition, and transfer. The learners in the more successful pairs tended to use a variety of the ten strategies.

Finally, data indicated these ESL learners went through a series of processes for successful learning (figure 2). Motivated learners set learning goals for themselves with the PSTs' help. Those who prepared themselves well by finding topics of discussion or information in the libraries, the WWW, and traditional learning environment aimed for frequent and quality interactions via e-mail with the PSTs. After each interaction, a review period prompted learners for more interactions. Learners who went through these stages concluded that they had learnt new information and increased their confidence in using English reading and writing skills. Needless to say, this result increased their motivation to learn and thus encouraged the start of another learning cycle.

6 Discussions and Conclusion

This study is significant to both distance-learning educators and language-learning educators. There are at least three reasons for this significance. First, the study provides insights for distance educators, both for those in Taiwan and for those in other countries who have Taiwanese students enrolled in courses that are delivered via telecommunications. The results of the study help these instructors to further understand Taiwanese students' positive perceptions of L2 learning through online technologies, identify suitable conditions and environment for these learners, and decide the extent to which this mode of instruction is applicable to students from this cultural background.

Second, the online intercultural communications issues explored in this study assist telecommunications users with more effective communication. They help users become aware of and anticipate problems when coming into contact with people of other cultures via distance technologies. Even without using online technologies, intercultural communication is already complex. Therefore, interaction may be hindered further when technology is the transmission medium. Understanding the barriers and facilitators of online intercultural communication leads to better and more successful intercultural interactions.

Third, the identified ten online learning strategies and online learning processes will add to the literature on language learning and teaching. Such research is in demand because ESL programs in the United States are planning to deliver more ESL courses to foreign countries via distance learning technologies.

In summary, most Taiwanese ESL learners had a positive experience with the online connection. The few connections that failed were due to lack of participants' response, lack of participants' motivation, and technical failure. Nevertheless, providing L2 instruction to learners over cyberspace is a method that should not be ignored. Learners need to be prepared with adequate intercultural communication skills and online learning strategies.

Follow-up investigation of online ESL acquisition might include specific amount of improvement on learners' writings and learning via synchronous technologies such as chats, interactive videoconferences, and desktop videoconferences.

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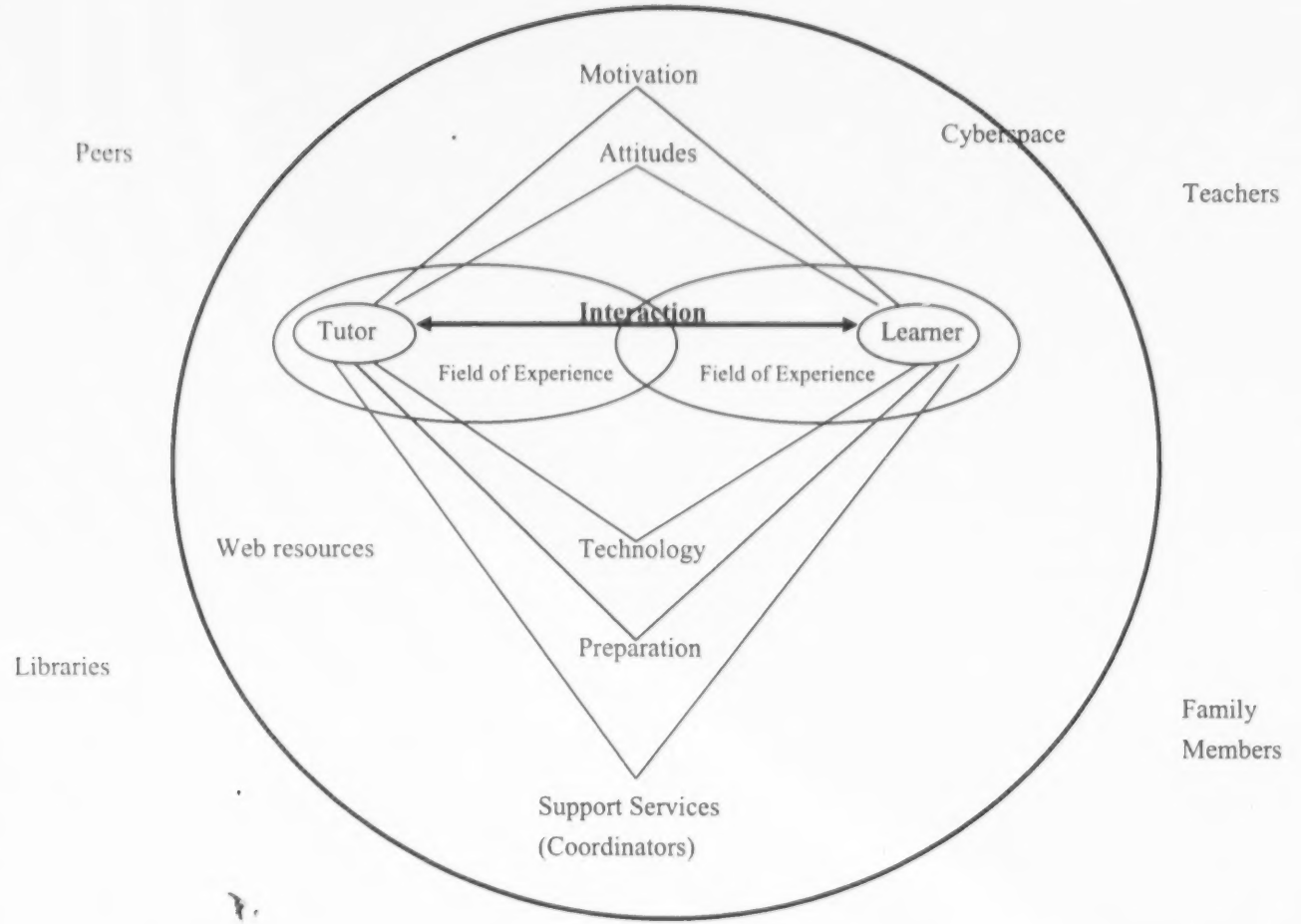

Figure 1. Factors Affecting Online Connections

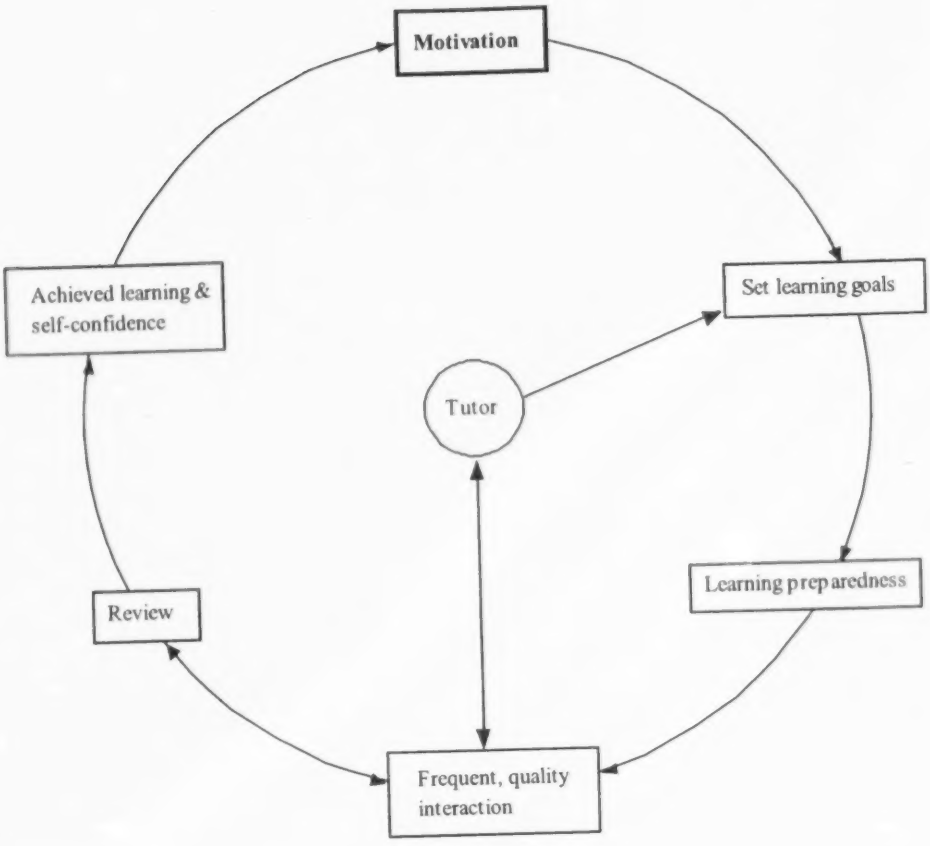

Figure 2. Online Learning Processes in the United States-Taiwan Connection.

Relating telecommunication training objectives to SMEs' actual needs

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The need of studying training measures to help European Small and Medium Enterprises (SMEs) to avail themselves of new information communication technology is generally acknowledged. To be effective, however, these measures must be based on sound knowledge of the context in which they are to be implemented. This type of approach is particularly important for SMEs located in areas experiencing serious industrial decline, where the development of exchanges and co-operation is vital for opening up new opportunities. Accordingly, we carried out a survey to gauge companies' attitudes towards teleconferencing tools so that methodologies could be devised to exploit the potential for growth within SMEs. The survey was based on a series of interviews conducted from late 1998 to early 1999 with organisations reflecting the socio-economic make up of the economy of Liguria, a region in north-west Italy. The results of the survey, that are discussed in this paper, formed the basis for the design of training schemes about teleconferencing tools and applications devoted to SMEs. The activity is framed into the project called Teleconferencing, part of the European Community's ADAPT II initiative.

Keywords: **Telecommunication education, Training in enterprises, Teaching/learning strategies**

1 Introduction

Current socio-economic trends and the shift towards a global market are highlighting the need for companies to keep abreast of the new opportunities offered by Information and Communication Technologies (ICT), whose development has itself been a major factor in market globalisation. Doing so also means gaining awareness of the economic, organisational and company policy issues involved.

In this context, the mastery of teleconferencing tools assumes particular importance. By giving impulse to distance interaction, these tools increase companies' opportunities to control a share of distant markets and to draw on resources spread over a wide area. This is borne out by numerous theoretical and applied studies that analyse the effects of tele-collaboration on the development of new communication patterns and their influence on company organisation [2].

Let's take a look at some of these. [1] examines the pros and cons of desktop videoconferencing from the technological, economic, operational, psychological, and managerial viewpoints, as seen by both the company and the end user. Wiesenfeld, Raghuram & Garud [15] analyse the characteristics of communication means and the impact these have on the way remotely located employees identify with the company's central offices. Kraut, Steinfield, Chan, Butler & Hoag [11] examine how the use of computer networks influences inter-company collaboration (such as that created in a European project) and how the use of those networks for co-ordination alters production output.

Jarvenpaa and Leidner [8] examine problems linked to creating and maintaining a climate of confidence whenever communication is largely conducted via ICT, while Anderson and Kanula [3] study a virtual

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forum attended by people engaged in lifelong learning, focusing on participation levels and attendees' perception of the forum's effectiveness and value. Email as a tool for supporting company policy is the theme explored by Romm and Pliskin [12], who draw on a set of case studies.

Rosen [13] provides numerous case studies on the use of videoconferencing in large corporations in an effort to stimulate discussion on the integration of collaboration and communication. This is done by analysing the competitive edge that those companies gained and the changes brought about in their way of doing business.

For their part, Schreiber and Berge [14] analyse the advantages and opportunities that teleconferencing systems offer to distance in-service training, reporting a number of cases where the goals pursued arise from a clear company need. Teleconferencing as a tool for lifelong learning is the topic focused on by Kaye [10], who examines in particular the possibilities that this instrument offers for learning in an informal context. Economic issues involved in the use of videoconferencing systems within the education sector is the area investigated by Jacobs and Rogers [7], who provide a detailed analysis of the cost/benefit ratio in a case of trans-European ISDN-based distance learning.

The above-mentioned studies generally refer to large, technologically-advanced corporations with considerable financial resources. However, in today's global market, it is also vital for Small and Medium Enterprises (SMEs) to harness ICT in order to maintain market share. The problem they often face is that they cannot afford the investment needed to cope with increased competition and to get a foothold in new markets. Distance interaction technology offers SMEs useful support in tackling this problem. On the one hand, it fosters collaboration between companies which operate in complementary sectors but are located at a distance from each other. On the other, it permits SMEs to offer their services to large companies both as suppliers and as mediators in local markets they know well. It is widely recognised that if SMEs are to harness the potential this technology offers, they not only require suitable and affordable infrastructure but also need training and technology transfer schemes to help them acquire the necessary competence and know-how ([6], http://europa.eu.int/comm/dg12/publ/globalisation.html).

These kinds of considerations form the basis of the numerous initiatives launched by the European Union and aimed to devise efficient training and orientation measures suitable to help SMEs to cope with innovation in communication.

To be effective, however, these measures must be based on sound knowledge of the context in which they are to be implemented. In this way, they can take account of the company's effective needs, economic situation, skills base, technological potential and cultural heritage. This type of approach is particularly important for SMEs located in areas experiencing serious industrial decline, where the development of exchanges and co-operation is vital for opening up new opportunities. For mainly economic reasons, these companies have little chance to develop competencies and to benefit from distance collaboration.

This is the background our work is set against. In particular, we carried out a survey to gauge companies' attitudes towards teleconferencing tools so that methodologies could be devised to exploit the potential for growth within SMEs. The survey was based on a series of interviews conducted from late 1998 to early 1999 with organisations reflecting the socio-economic make up of the economy of Liguria, a region in north-west Italy.

The activity is framed into the project called Teleconferencing, part of the European Community's ADAPT II initiative. The purpose of the project is to study the potential of network technology, especially teleconferencing tools, in response to the need for intra-company and cross-company collaboration. The project is run by IMA-CNR, who drew up the project guidelines in partnership with eight companies representing a cross-section of the local economy in Liguria.

We shall report here the findings of the survey, focusing in particular on cultural problems hindering the spread of teleconferencing in companies. In addition, we shall propose orientation and training methodologies that help overcome these barriers.

Henceforth, we shall use the term teleconferencing to refer to interpersonal communication systems based on the written word (e-mail, chatting, etc) or on sound and images (videoconferencing).

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2 The Survey

2.1 Background

Liguria has been seriously hit by the general decline in industry; the reduction in heavy industry in particular has wrought serious consequences, including high unemployment, demographic decline and ageing of the population. The socio-economic transformation underway calls for considerable flexibility, the capacity to exploit innovation and the fostering of exchanges and co-operation in order to open up new opportunities. Thus the region of Liguria represents a good test-bed for studying opportunities and problems regarding the use of teleconferencing technology within companies.

Our survey involved a series of interviews conducted from late 1998 to early 1999 with 41 companies in Liguria that varied in size, both in terms of turnover and staff numbers (see Table 1). Of the total, 20% are from the public sector and 80% from the private sector, and they are spread throughout the four provinces of the region (32% Genoa, 32% La Spezia, 20% Imperia and 17% Savona).

Revenue 1997 (Millions of EURO)	**Percentage**	**Staff members**	**Percentage**
To 2.5	**37%**	To 10	**17%**
2.5 to 50	**49%**	10 to 100	**63%**
Over 50	**15%**	Over 100	**20%**

Table 1. Breakdown of the organisations interviewed according to turnover and staff numbers

2.2 Methodology

The survey was carried out through interviews based on a questionnaire. Staff members from companies involved in the project were consulted during the drafting of this questionnaire to ensure that the language used and the approach to problems adopted matched their way of thinking as closely as possible. The companies themselves carried out preliminary evaluation of the questionnaire.

2.3 The Questionnaire

The questionnaire is divided into four sections.
The first section is designed to identify the type of company in terms of economic structure (public or private, size, field of activity) and its organisation, with special attention to teamwork. In this way it is possible to investigate the relationship between these parameters and the attitude manifested towards teleconferencing tools.

The second section looks at the organisation's level of technological advancement and its attitude towards communication tools. The purpose here is to understand whether and how networking can modify the kind of relationships established within the organisation.

The aim of the third section is to analyse the type and quality of computer tools devoted to information exchange. Investigation centres on the use made of the Internet and on the organisation's attitude towards the Web, with an eye to determining whether the staff is familiar with this tool, the needs the Web may fulfil and possible training requirements (depending on the type of information usually exchanged).

The fourth section focuses on teleconferencing, assessing the degree of knowledge about tools of this kind and determining whether and when the organisation considers teleconferencing useful for its purposes. The point of this section is to study the types of support (methodological, technical, training, orientation, infrastructure, etc) that the organisation may need in order to use teleconferencing effectively.

3 Results

3.1 Type of organisation and group work

Type of organisation. The public-sector organisations interviewed were from the fields of public administration, public services, the health service and state-run industry.
The breakdown of private companies was as follows:

- industry (14%) – steel, photographic chemicals, electronic engineering, parts machining, plant building, construction, olive oil production, floriculture;
- companies involved in port-based activities (17%) – port authority, shipbuilding, container terminals, transport, brokerage;
- service and commercial companies (49%) – gas and water distribution, medical services, company support services, research and training, tourism, logistics, storage, consultancy, wholesaling and retailing.

Sectors like port activities, olive oil production, floriculture and tourism are of vital importance to the Ligurian economy.

Teamwork. All of the companies interviewed engage in teamwork, and most (82%) do so on a regular basis; there are no notable differences here between the different types of companies. Teamwork mainly concerns organisation (90%), document and information sharing (63%) and brainstorming (63%). Other significant areas are internal documentation (61%), followed by external relations (59%) and internal messaging, while internal surveys play only a minor role (29%).

Interestingly, given that in nearly half the cases (46%) teamwork involves most of the staff, tools that make collaborative activities more efficient would be extremely valuable for the organisation. Hence it is worth studying the possibility of teleconferencing, at least for some specific situations such as electronic bulletin boards advising recipients about 'technical' events. These may include notification of a circular being received or a service being temporarily suspended. Another instance may be an in-house electronic bulletin briefing all the staff on the main events concerning the organisation. The application of teleconferencing to these situations does not curb interpersonal relationships and has the advantage (even in small companies with a staff of 10 to15) of reducing time wasting, the risk of misinformation and subsequent misunderstandings [1].

3.2 Office Automation

Level of office automation. Computers, in-house networks for management purposes and Internet connections are found in most of the organisations (see Table 1).

	Used	To be introduce	Not to be introduced
Mainframe	63%	5%	12%
Terminals	66%	0%	15%
Personal computers	100%	0%	0%
LAN	63%	5%	15%
Intranet	15%	22%	22%
Internet connection	85%	12%	2%

Table 1: Computer tools used in organisations

However, while PCs are used by the majority of staff members (either for individual work or management applications), the Internet is still only used by a minority (see Table 2).

We can therefore state that while computers have by now permeated corporate life, the same is not true of communication and information sharing tools, although awareness of their potential does exist.

	PC for individu work	Terminals o PC for database management	LAN or Intranet for shared applications	External connection/Internet
More than half	34%	37%	23%	9%
About half	13%	14%	15%	9%
Less than half	53%	49%	62%	82%

Table 2: Number of users by type of tool and kind of use

Use of networking. Networks are widely employed for exchanges between headquarters and branches (14

positive answers, two planning introduction in the short term). They are used mainly for handling administrative/accounting matters and sales orders, for organising production, as well as for structuring and maintaining the network itself.

Far less significant is the level of network use by travelling salesmen (two cases, for transmitting sales and exchanging messages), although the trend is growing (six planning to introduce it for this purpose).

Tele-working from home is equally uncommon, with only two of the organisations surveyed adopting it, and five cases where there has been talk of introducing it. In both of the affirmative cases, tele-working is used for remote network maintenance, and only one of the two companies conducts other activities in this way.

In our view, the answers indicate that network connection is seen as an advantage when it is capable of improving work efficiency without changing work organisation or modifying internal relationships. By contrast, when the introduction of new technology requires methodological innovation or the development of new types of interpersonal relationships, its appeal is not so strong. One fact supports this consideration: although many of the organisations hire external consultants (68% have at least one consultant, 46% more than one), only one currently uses tele-working for this purpose and three are considering it. Clearly, technological innovation demands a change in attitude and therefore requires gradual phasing in, together with training that makes people aware of the impact of new communication tools rather than just illustrating their technical features.

3.3 Networking and communication with the outside world

Typology of dedicated connections and connections to the Internet. Those interviewed appeared to be greatly perplexed by this set of questions, apart from a handful of cases where the interviewee was the head of EDP. To our way of thinking, this shows that the spread of the network has not been matched by a general grasp of network-related concepts. Consequently, training and orientation dedicated to network concepts and opportunities are called for, so that companies understand the kind of network services that might meet their needs.

Companies and the Web. The Web is used somewhat more for gathering information (86%) than for spreading it and for presenting the company on the market (80%). Nonetheless, the response to the question regarding the potential benefits of using the Web shows that companies recognise that the Web is a medium for addressing a wider market (49%) and improving their public image (37%).

In our view, the reason for this lies in cultural and economic factors. Coverage of the Web in the press and electronic media till recently mainly focused on the possibility to acquire information rather than provide it. What's more, while acquiring information is relatively straightforward, providing it entails more complex know-how. Company presentation in the Web's hypermedia format is culturally different from more conventional forms, thus requiring great investment in terms of conception, design and implementation. Finally, the investment and maintenance entailed in information acquisition is fairly low in cost, being limited to getting Web access and covering communication costs. By contrast, information providing is quite costly both in terms of site construction and maintenance.

In order to help companies use the Web as a tool for market presentation, it may well be worthwhile providing implementation methodologies that are in line with company goals. To make information hunting more efficient, it would be useful to give tips about the most interesting commercial sites and advice on search methods.

Advantages, disadvantages, information to include on the site. The main advantages that companies see in the Web are the possibilities for market expansion (49%), for improving public image (37%) and, obviously, for low-cost access to information (49%) (see Figure 1). This response shows that companies now view the Web as a standard means for widespread distribution of information, and the sort of information they envisage providing at their sites matches this vision.

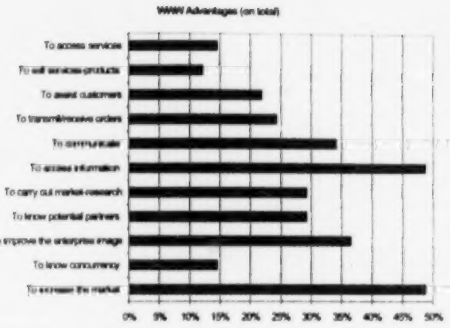
WWW Advantages (on total)
To access services
To sell services-products
To assist customers
To transmit/receive orders
To communicate
To access information
To carry out market-research
To know potential partners
To improve the enterprise image
To know concurrency
To increase the market
0% 5% 10% 15% 20% 25% 30% 35% 40% 45% 50%

Figure 1 - Advantages of the We

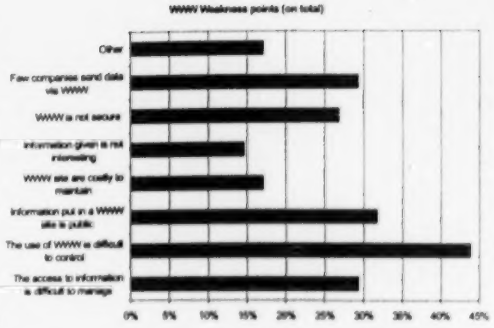
WWW Weakness points (on total)
Other
Few companies send data via WWW
WWW is not secure
Information given is not interesting
WWW site are costly to maintain
Information put on a WWW site is public
The use of WWW is difficult to control
The access to information is difficult to manage
0% 5% 10% 15% 20% 25% 30% 35% 40% 45%

Figure 2 - Disadvantages of the Web

There is far less interest in using the Web for commercial purposes such as placing orders (24%), acquiring information about competitors (15%), product sales and services (12%), or customer support services (22%). This lack of confidence is confirmed by the answers regarding the Web's perceived weak points: lack of security (27%), competitors' access to information (32%), and unwillingness to transmit data over the Web (29%) (see Figure 2).

In our view, a further hurdle to commercial use of the Web is the lack of control over how the user accesses a site (29%). Technological mediation makes it particularly difficult to discern client needs and provide the right response. This, together with the fact that many of the companies interviewed see the Web as a means of serving clients and providing information on products, highlights the economic importance of building web sites that can also offer customer-care services.

An interesting perspective on this problem comes from research into adaptivity concepts, which seeks to construct Web sites that dynamically select the information to be displayed according to the user's behaviour during site navigation [4, 5]. We believe it would be useful to draw companies' attention to these studies, as application of such techniques might give their web sites a crucial edge in marketing and business.

To our way of thinking, there are many factors that contribute to the Web's image as an unreliable commercial tool, most notably: the lack of thoroughly tested sales methodologies, the need to invest both in technology and in the study of new models of sales organisation; the uncertainty of results; the market's suspicious attitude.

A further obstacle to widespread Web use within companies is the impossibility of controlling the use the staff makes of it (44%). This is a major hindrance to the spread of network-based distance communication. The problem is a realistic one, even if psychological restraints exist that allow general use of the Web under acceptable conditions.

3.4 Teleconferencing and interpersonal communication

Analysis of the answers reveals that while e-mail is widely employed, other teleconferencing systems are not so common; what's more, there is little interest in evaluating their adoption in the future and even a certain degree of reluctance to examine the possibility at all (see Table 3).

What lies behind this situation is poor knowledge of teleconferencing tools, as demonstrated by the small number of responses about related benefits and drawbacks. This is understandable, given that networks have only recently reached Liguria's small and medium-size enterprises [9].

	Used	To be introduced	Not to be introduc	No answer
Video-conference	7%	20%	44%	29%
E-mail	85%	12%	2%	0%
Computer conferencing	7%	15%	49%	29%
Desk-top video-conferencing	5%	10%	51%	34%
Chat	2%	2%	56%	39%

Table 3 – Attitude towards teleconference systems

Let's take a closer look at the answers about e-mail's benefits and drawbacks and compare them with those regarding other teleconferencing tools. It must be noted, however, that the comparison can only be qualitative because the number of responses varies depending on the tool in question.

E-mail is considered advantageous in terms of communication potential, lower communication costs, image and innovation. It is relatively straightforward for the staff to use, relies on fairly simple technology and is regarded as highly beneficial. It meets companies' basic need to communicate swiftly in writing, and calls for innovation only in the tool to be used for the task, not the underlying methodology. The technology required is simple and relatively cheap, and what's more in many cases it has already been tested by the company's decision-makers on a personal basis.

In addition, it must be noted that the introduction of e-mail within a company is in itself capable of enlarging the company's market both for reasons of prestige (as the answers reveal) and because e-mail is becoming a standard form of communication parallel to telephone and fax.

Conversely, other types of teleconferencing systems, and particularly those that involve computers, are look upon with suspicion; people are clearly concerned that the perceived drawbacks (complex technology, lack of know-how among the staff, and modest gains) may outweigh the advantages. In our opinion, the reason for this kind of response lies in technological and socio-economic factors.

In technological terms, it cannot be denied that these systems are fairly intricate, apart from chat-oriented ones. This is particularly true for those who are relative newcomers to computer-mediated communication. Employing these systems efficiently presupposes technical know-how within the company and well-trained staff.

From a socio-economic viewpoint, these tools contribute to modify work organisation and methodology, thus entailing a transformation in social relationships. For these systems to be fully exploited, considerable innovation effort is required: the organisation must have the need and the ability to carry through change, as well as the capacity to develop methodological skills. In addition, costs are incurred that cannot be offset either by greater prestige or by access to widely used forms of communication.

It must be added that advanced teleconferencing systems have not yet gained a high profile in popular culture; they have received far less media attention than e-mail and the Web, as their usership remains fairly small.

Despite all this, companies acknowledge that computer-based teleconferencing tools might offer valuable assistance in certain corporate areas (see Figure 3). Furthermore, the boom of outsourcing and the introduction of tele-working will probably have an impact on the development of computer-driven teleconferencing tools. These forms of collaboration have brought various problems to the fore: that of identifying oneself within the organisation, of conveying one's ideas to the interlocutor without misunderstandings, of conducting effective discussion about a written document, a graph, etc.

Considering these factors, we believe that orientation and training programmes are vital in order to help companies understand the potential of these tools, both in operational as well as theoretical terms.

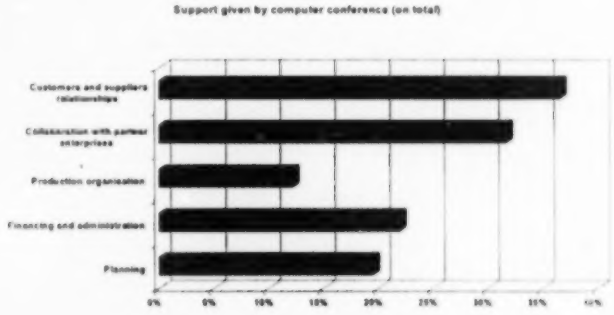

Figure 3 – Support given by computer conference

4 Conclusions

The survey shows that the spread of the network among Liguria's small and medium-sized enterprises has not been matched by a general grasp of network-related concepts. Consequently, training and orientation dedicated to network concepts and opportunities are called for, so that companies understand the kind of network services that might meet their needs.

Moreover, the survey reveals that these enterprises are aware of the potential of networking tools in expanding information sharing and communication possibilities. This awareness, however, is restricted to forms of use that do not modify work organisation and interpersonal relationships; one reason for this is that companies do not yet have the firm grasp of network concepts required to envisage applications in less immediate contexts. In fact, there is no perception at all of such applications because this would require awareness of the tools, an understanding of the actual possibility of achieving greater productivity, changes in organisational structure and internal relationships, and an investment in technology and know-how.

As these results reveal, there is a clear need to develop orientation and training projects addressed to SMEs. These should provide:

1. Network concepts and opportunities, so that companies understand the kind of network services that might meet their needs. In particular, enterprises should be helped to learn the following:
   1.1. Basic notions about network technology;
   1.2. Infrastructure and public services;
   1.3. Distance communication methods and techniques;
   1.4. Methods of sharing documents and applications.

2. General skills in teleconferencing tools as well as methodological and content-based knowledge of potential advantages in relation to specific needs. In particular, enterprises should receive training so that they are able to do the following:
   2.1. Explore typical working tasks and decide what type of teleconferencing tools, if any, can increase the quality of the job;
   2.2. Investigate if and how the use of teleconferencing tools can favour the introduction of organisation methods not adopted in the enterprises, but able to improve competitiveness;
   2.3. Critically analyse a communication technology to define how useful it can be in a specific work situation;
   2.4. Recognise specific tools as particular examples of communication models;
   2.5. Abstract the communication features of a software tool so as to be capable of comparing one tool with another of the same class without difficulties.

3. Awareness of the psychological and cognitive issues entailed in communication and collaboration through the computer. Specifically, enterprises should gain practical awareness that:
   3.1. Computer-mediated communication differs from direct communication, and calls for adjustment in the ways one interacts with others;
   3.2. All those involved in an activity requiring computer-mediated communication, especially those without a technological background, must be able to call on technical support. In this way they will be encouraged, psychologically as well as practically, to use the new tool;
   3.3. If an experiment in the use of distance interaction methods is to be successful, there first needs to be a well-established atmosphere of reciprocal trust between the participants;
   3.4. People must be aware of both the opportunities and technical limitations of the tools used;
   3.5. To encourage the use of these systems, the work needs to be organised in such a way that each person gets a turn at assuming responsibility for some task or other;
   3.6. The system must be made indispensable for getting access to information and joining in discussion.

It is no easy task to create training schemes, including experimental ones, that meet these conditions. There are a number of reasons for this. From the educational viewpoint, an approach to training is called for that combines conventional training with a situated approach to the learning of teleconferencing opportunities and problems. When it comes to choosing the topic on which the training initiative is to be based, it is necessary to ensure that it is one of common interest to all the companies involved. Then there is the matter of the required expertise, calling for the involvement of various actors: training experts, to select the best methodology for tailoring the programme to the context; company representatives, to spell out production and organisational requirements; experts in the subject area; and experts in the specific technology. In economic terms, a balance must be struck between the need to provide up-to-date technology and the

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necessity for companies to contain costs.

European projects like *Teleconferencing* that are designed to help enterprises cope with innovation provide strong impulse in this direction. They create the conditions under which pilot projects of the kind described above can be introduced, provide tools for evaluating their effectiveness, and form the cultural background needed to built advanced technology training systems that meet the needs of enterprises.

Acknowledgements

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Web Based Real plus Virtual Observatory Project

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We have been developing remote telescope system, which can be used by remote site via Internet with web user interface. Student in remote site can control the telescope easily and can see live picture of celestial bodies. If there is time difference between student's site and telescope's site, the student can see live picture of celestial bodies in daytime in classroom. It will be strong tool to learn astronomy. Moreover we are also developing virtual observatory which shows the status of the real telescope in a virtual space. The virtual observatory supports virtual planetarium, so that student in remote site can know what can be seen in the sky of telescope's site. Moreover a learning environment to learn the structure, behavior and function of telescopes were developed in virtual world. The remote telescope system is easy to use, so that it neglects chance to learn how to use the telescope. In science education, it is also important to teach how to use equipments. The learning system compensate for it.

Keywords: **Remote Telescope, Virtual Observatory, Astronomical Educaion**

1 Introduction

We have developed a remote telescope system in a public observatory in Japan [1]. This first version has a web based user interface, and remote student can use the system from remote site via Internet. If the client site has certain time difference between Japan, the student can see live picture of the celestial bodies in daytime. Moreover the student can operate the telescope as he/she wishes by using slight motion buttons on the web based user interface. This first version was the world first interactive remote telescope which offers live picture on a web user interface in 1997, though a remote telescope offering still image was made before[2].

Although the first version of the remote telescope system were quite successful, it has some problems. The system does not have the function for exclusive control. The exclusive control is necessary in the multi-user environment, because more than two clients cannot use the system simultaneously. On the first version, the student must promise the date and time of the usage in advance.

Another problem of the first version is that the telescope is too huge (105cm reflector) to use as a remote telescope. Besides the dome of the observatory is not controlled from remote site. Therefore the staff of the observatory must always help the usage.

We are now developing second version of remote telescope system to solve the problems of the first version. The second version uses small telescope (Meade LX200 20cm reflector), so that it is easier to use as a remote telescope.

The second version has a scheduling system, which can work as the exclusive control. Clients can reserve the date and time of usage of the remote telescope on a web page for scheduling. The system has 3D planetarium as well as web user interface. The planetarium shows what can be seen in the real sky where the telescope is located. Moreover the second version supports vertual environment to learn structure, behavior and function of various types of telescope. These virtual planetarium and virtual environment for

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learning are regarded as virtual observatory. Although today some other remote telescopes has been developed in the world [3-6], our remote telescope is unique which supports virtual observatory.

2 Scheduling system

The scheduling system was developed for multi-user usage (Fig.1). It has two important function. They are exclusive control system and reservation system. Exclusive control system enables to permit usage by only one client at every time. If a student tried accesses to the system during the usage by another student, the exclusive control system reject it, and make him/her wait until the superior student terminates the usage. Reservation system enables to reserve date and time of usage in advance. The reserved usage is superior to non reserved usage, so that non reserved usage is terminated by force when it is the time of reserved usage.

The scheduling system is made by using CGI(Common Gateway Interface), and the CGI program works by a scheduling web page on a public directory. Clients' information such as account information and reservation information, is preserved in a file in the scheduling system. Since the file includes very important contents, it must be protected from illegal access. The file is not on the public directory, but on a private directory to which cannot be had access. The security is kept by this method.

Fig.1 Scheduling system

3 Live picture

The live picture of celestial bodies enhances students' learning of astronomy (Fig.2). There are two methods to send live picture. One is by stream, the other is by still image series. We are currently using the latter way. SGI O2 Unix workstation is used as a camera server. O2 has a program which takes still image with CCD camera. Our system utilize the program, and automatically save JPEG picture in every three second into a same file in the camera server. We also developed Java applet which has access to the file, and read it, then display the still images continuously. Remote clients can see live picture as if it is animation.

4 Remote control of the telescope

A student can control the telescope from remote site. In the first version of the remote telescope system, we

used CGI to control the telescope. In the second version, we considered that we would use CGI on a HTTP server, however CGI has the following problems.

(1) When a client terminate usage of the telescope, it is impossible for the server to refuse connection.

(2) More than two clients can have access to the remote telescope system simultaneously at anytime. Therefore it is impossible to realize exclusive control.

Fig.2 Live picture (Example: Moon)

(3) In a collaborating learning, more than two clients have access to the system simultaneously. In this case, the same number of CGI process as the clients' number run in the server, so that the load of the server become heavy.

We used Java applet in order to solve the problems. The merit of communication by Java applet is as follows.

(1)When a client terminates usage of the telescope, it is possible for the server to disconnect the connection.

(2) It is possible to realize the exclusive control.

(3) It is possible for the server to send various information to Java applet at client machine.

By these reason, we developed a telescope control program by Java applet. The procedure of usage is as follows.

(1) A client set a target celestial body, and push the submit button. Then the command to control the telescope is sent to the server program.

(2) The server program receives the command and send it to serial port. Then the telescope receive the command, and it moves to get the target.

(3) The telescope send status to the server, after it finish moving.

(4) The server program send the status to applet at the client machine.

Figure 3 shows the procedure.

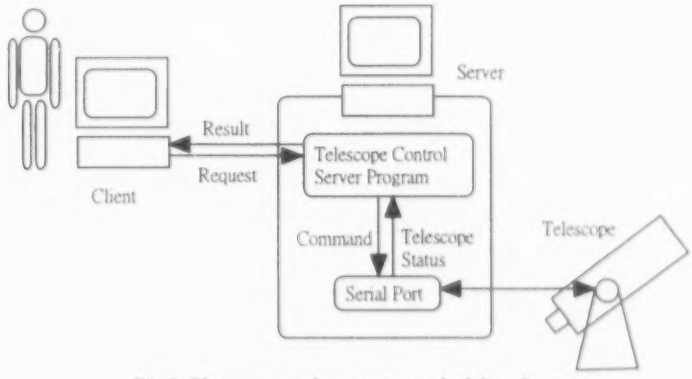

Fig.3 The process of remote control of the telescope

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5 Graphical user interface

The GUI of remote telescope system is made by applet. The GUI by applet in second version has the following functions (Fig.4).
(1) To move telescope by setting target's coordinates
(2) To move telescope by selecting a target in a menu
(3) To move telescope by slight movement buttons
(4) To show local time where the telescope is located
(5) To show universal time
(6) To show the rest of the reserved time
(7) To show some information about the target

In the above, functions (1)-(3) are the same as the first version. A student can control the telescope easily by the GUI. The slight movement buttons enable the student to move the telescope slightly, so that the student can scan the celestial body. This function is especially useful when the student observes apparently large target such as the moon. The student can feel as if he/she is traveling over the moon by space ship.

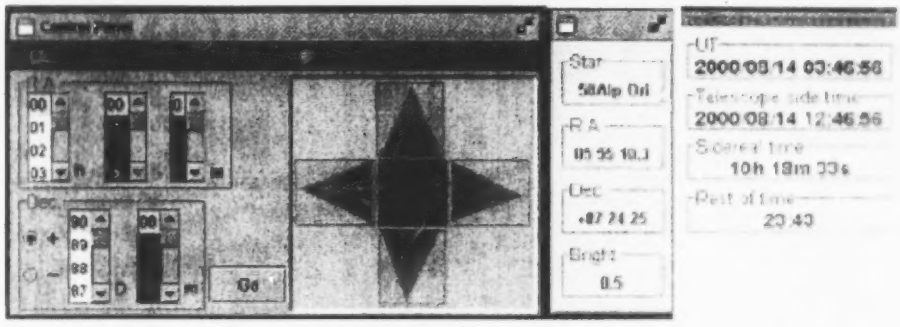

Fig.4 Graphical User Interface

6 Virtual Planetarium

The planetarium is made by Java3D (Fig.5). The planetarium reflects the real sky where the telescope is located by calculating sidereal time. Remote clients in all over the world can know what can be seen in the sky at that time at telescope site, such as stars, planets, nebulas, and galaxies. The planetarium also has a telescope model in the center of the planetarium. It is a kind of virtual telescope. The virtual telescope reflects the real telescope. The direction of the virtual telescope indicates that of real telescope. By this function, clients can know easily in which direction the telescope is. Since a beam line from virtual telescope to celestial sphere is shown in the planetarium, the user can easily recognize which star the telescope catches currently. Besides when the user click one of stars on the virtual planetarium, both virtual and real telescopes start to move, and catche the target star.

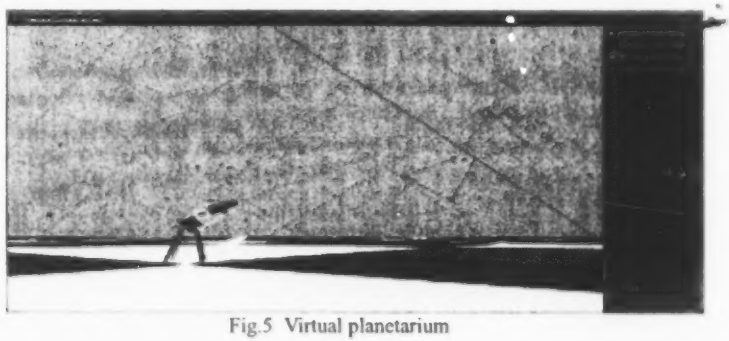

Fig.5 Virtual planetarium

7 Learning environment for learning telescopes in virtual world

In science education, it is important for students to observe target in real world as well as to learn how to use the equipments for the observation. The remote telescope system enables to observe real celestial bodies in the classroom. Nevertheless it neglects to learn how to use telescope. Because students can easily operate the remote telescope system without knowing the structure of the telescope and every function of each part.

We have been developing a system in virtual world, by which students can learn kinds of telescopes, every structure, every characteristics, and every function. The system is made by VRML, and the telescopes in the virtual world can be moved around two axes. The astronomical telescopes are classified optical structure and by mounting structure independently. Therefore the system has a table which shows the combination of optical structure and mounting structure (Fig.6). Some combinations exist and other combinations do not exist. If a combination exists, a circle is filled in the table. If it does not exist, a cross is filled. Triangle means seldom existence, dot means rare existence. This table guides students to every combination. If a student click a symbol (circle, triangle, dot), then the telescope is shown with the combination of optical and mounting structure.

Since the virtual telescopes can be rotated around two axes by mouse dragging, students can learn how to operate telescopes. Besides students can learn the function of every axis by rotating it. For instance, one axis of equatorial mounting is set in the direction to polar star (Fig.7). The telescope can track a celestial target by rotating around the axis, because the celestial target moves in the sky in accordance with earth's self rotation.

Moreover the virtual telescopes show optical structure of them, and show ray trace. When the a student rotates a virtual telescope, he/she can know how the focus point of the telescope moves. Students can learn the focus points do not move in some types of telescope. They can know such type of telescope is useful for attaching heavy equipment on the focus point.

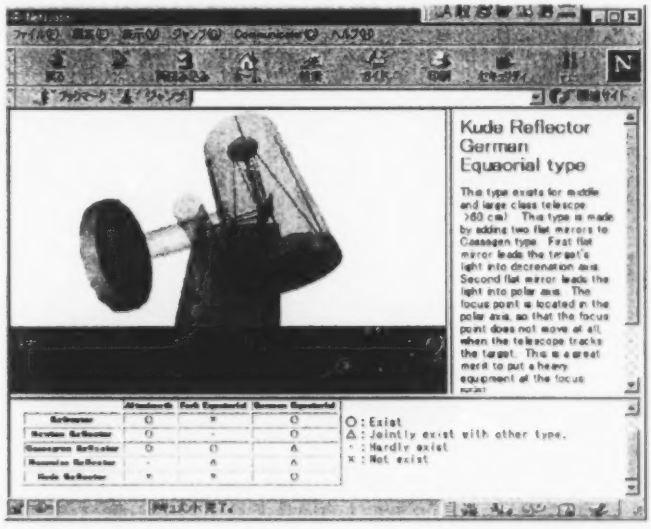

Fig.6 Virtual environment for learning structure and behaviour of various type of telescope

8 Conclusions

In this paper, we described the second version of remote telescope system. We explained scheduling system, telescope control, GUI, live picture, virtual planetarium and learning system. This total system can be regarded as synthesis of real observatory and virtual observatory. The real observatory offers live picture of celestial bodies. The virtual observatory offers planetarium and learning system. In the remote telescope

system, students can operate the telescope easily, so that it neglects the chance of learning how to use the telescope. In science education, it is also important to learn how to use the observation equipment. The virtual observatory compensates for it.

The student can observe real celestial objects by real observatory from remote site. If there is time difference between the client site and observatory site, the student can observe real celestial objects in daytime in classroom. It will be a strong tool to learn astronomy. This system brings experimental environment into classroom in astronomical domain.

Our future work is to make dome or sliding roof and to install the telescope in it.

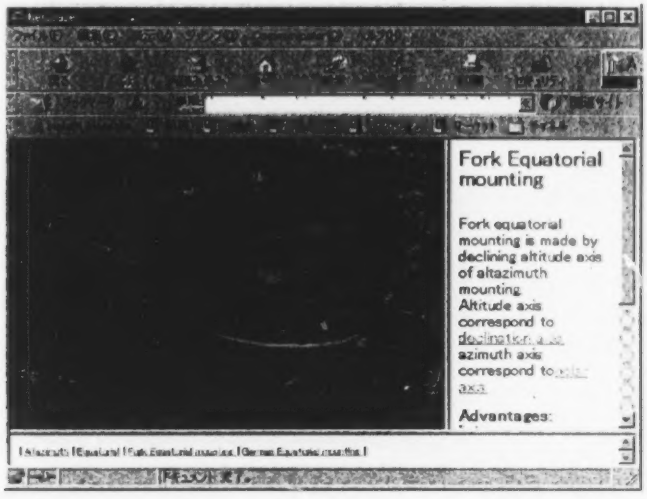
Fork Equatorial mounting
Fork equatorial mounting is made by declining altitude axis of altazimuth mounting.
Altitude axis correspond to
azimuth axis correspond to
Advantages:

Fig.7 Virtual environment for learning function of parts of a telescope

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